PB81-154015

Review of the Department of Energy's Conservation and Solar Energy Programs
A Report to the President and Congress

Calculon Corp.
Arlington, VA

Prepared for

Environmental Protection Agency
Washington, DC

Jan 81

U.S. Department of Commerce
National Technical Information Service
NTIS

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-600/7-81-001

2.

3. RECIPIENT'S ACCESSION NO. PB 81-154015

4. TITLE AND SUBTITLE
The Federal Nonnuclear Energy Research and Development Act (Public Law 93-577) Section 11 Report to the President & Congress

5. REPORT DATE January 1981 (Date of publication)

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
U.S. Environmental Protection Agency
Office of Environmental Engineering and Technology

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
CALCULON Corporation
1501 Wilson Blvd.
Arlington, VA 22209

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO. 68-02-3078

12. SPONSORING AGENCY NAME AND ADDRESS
U. S. Environmental Protection Agency
Office of Research and Development
Office of Environmental Engineering & Technology
Washington, D. C. 20460

13. TYPE OF REPORT AND PERIOD COVERED final

14. SPONSORING AGENCY CODE EPA/ORD/17

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report summarizes findings and views gathered during the past year on Section 11 of the Federal Nonnuclear Energy Research and Development Act (Public Law 93-577). Individuals from various sectors of the government and private industry met in a series of workshops and a National hearing to review Federal energy conservation and solar energy programs. The discussion focused primarily on four key issues: energy policy analysis; program evaluation; DOE state and local assistance programs; research, development and application.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Solar Energy & Conservation 1. Policy analysis 2. Program evaluation 3. R & D program analysis 4. DOE State & Local Assistance Programs	Solar Energy Energy Conservation	10A 10B

18. DISTRIBUTION STATEMENT Release to public	**19. SECURITY CLASS** *(This Report)* Unclassified	**21. NO. OF PAGES** 80
	20. SECURITY CLASS *(This page)* Unclassified	**22. PRICE**

EPA Form 2220-1 (9-73)

United States
Environmental Protection
Agency

Office of
Research and Development
Washington DC 20460

EPA 600/7-81-001
January 1981

Office of Environmental Engineering and Technology

PB81-154015

EPA

Review of the Department of Energy's Conservation and Solar Energy Programs

A Report to the President and Congress

Prepared by the Environmental
Protection Agency under
direction of Section 11 of the
Federal Nonnuclear Energy
Research and Development Act
(Public Law 93-577)

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA 22161

Public Law 93-577
93rd Congress, S. 1283
December 31, 1974

An Act

To establish a national program for research and development in nonnuclear energy sources.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

SECTION 1. This Act may be cited as the "Federal Nonnuclear Energy Research and Development Act of 1974".

Federal Nonnuclear Energy Research and Development Act of 1974.
42 USC 5901 note.
88 STAT. 1878

ENVIRONMENTAL EVALUATION

SEC. 11. (a) The Council on Environmental Quality is authorized and directed to carry out a continuing analysis of the effect of application of nonnuclear energy technologies to evaluate—

42 USC 5910.

(1) the adequacy of attention to energy conservation methods; and

(2) the adequacy of attention to environmental protection and the environmental consequences of the application of energy technologies.

(b) The Council on Environmental Quality, in carrying out the provisions of this section, may employ consultants or contractors and may by fund transfer employ the services of other Federal agencies for the conduct of studies and investigations.

(c) The Council on Environmental Quality shall hold annual public hearings on the conduct of energy research and development and the probable environmental consequences of trends in the development and application of energy technologies. The transcript of the hearings shall be published and made available to the public.

Hearings.

Transcript, availability.

(d) The Council on Environmental Quality shall make such reports to the President, the Administrator, and the Congress as it deems appropriate concerning the conduct of energy research and development. The President as a part of the annual Environmental Policy Report required by section 201 of the National Environmental Policy Act of 1969 (42 U.S.C. 4341) shall set forth the findings of the Council on Environmental Quality concerning the probable environmental consequences of trends in the development and application of energy technologies.

Report to President, Administrator, and Congress.

Review of the Department of Energy's Conservation and Solar Energy Programs

A Report to the President and Congress

Prepared by the
Environmental Protection Agency
under direction of Section 11
of the Federal Nonnuclear Energy
Research and Development Act
(Public Law 93-577)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE ADMINISTRATOR

LETTER OF TRANSMITTAL

January 1981

I am pleased to submit herewith, to the President of the United States, the Speaker of the House of Representatives, and the President of the Senate, the Environmental Protection Agency's Report to the President and Congress in accordance with the mandate contained in Section 11 of the Federal Nonnuclear Energy Research and Development Act (Public Law 93-577).

The Act requires the Agency to conduct a "continuing analysis of the effect of the application of nonnuclear energy technologies to evaluate: (a) the adequacy of attention to energy conservation methods, and (b) the adequacy of attention to environmental protection and the environmental consequences of the application of energy technologies."

This Report sets forth the Agency findings concerning the adequacy of attention by the Department of Energy to energy conservation. "Adequacy of attention" to energy conservation for the 1980 Section 11 program was measured in three ways: adequacy of the resource allocation process, adequacy of implementation plans and management processes and adequacy of evaluative information for decision-making.

We have sought to define both the scope and context of these issues. The Report reflects the full range of opinions available to the Agency, incorporating the ideas and thoughts of interested individuals obtained through public hearings mandated by the Act.

I trust that the Report proves fully satisfactory. If such is not the case, or if there are any additional questions or comments, please contact me.

Sincerely yours,

Douglas M. Costle

Table of Contents

Page

Executive Summary 1

Introduction 7
  The Section 11 Mandate 9
  1980 Section 11 Program Focus 9
  1980 Section 11 Program Activities 10

Conclusions and Recommendations 11
Definition of Adequacy of Attention 13
  Resource Allocation Process 13
  Implementation and Management 14
  Evaluative Information 14
  The Role of Government in the Energy Market 14
    Background: The Nature of the Energy Marketplace 14
    Government's Role in Conservation 15

Assessment of the Resource Allocation Process 17
  Background 17
  End-Use Sector Framework 18
  Analytical Tools 19
    The Least-Cost Criterion 19
    The Oil Import Premium 20

Assessment of Implementation and Management 22
  Background 22
    Legislative History 22
    Organizational History 22
    Characteristics of Conservation and Solar Programs 24
  Integration of Conservation and Solar Programs 24
  Coordination of Information Programs 25

Page

Appropriate Management of State and Local Programs 28
  Partnership 28
  Need for Comprehensive Review 31
  Program Specific Issues 31
  Weatherization Assistance Program 32
  Residential Conservation Service 34
  Institutional Buildings Conservation Program 35
Appropriate Management of Research and Development 36
  Innovation 36
  Procurement and Financial Assistance 38
  Field Activities 39

Assessment of Program Evaluation 41
Background 41
  Need for Evaluation 41
  Current DOE Evaluation Activities 42
Uses of Evaluation 43
Evaluation Policy 44
Institutional Barriers to Implementation 47
Methodological Barriers to Implementation 48

Appendices 51

References .... inside back cover

Executive Summary

Background

The Federal Nonnuclear Energy Research and Development Act of 1974 was enacted to support a broad range of energy technologies. In creating this program, Congress demonstrated its concern that conservation and environmental protection receive adequate attention in Federal energy research and development. To ensure that this intent was carried out, it included a requirement in the Act (Section 11, Public Law 93-577) for "a continuing analysis of the effect of the application of nonnuclear energy technologies to evaluate:

(1) The adequacy of attention to energy conservation methods; and

(2) The adequacy of attention to environmental protection and the environmental consequences of the application of energy technologies."

In carrying out the requirements of Section 11, during the past two years the Environmental Protection Agency (EPA) has focused on the environmental aspects of the mandate. In 1980, the Section 11 review shifted its emphasis to assess the adequacy of attention to energy conservation. Because of the close legislative, organizational, and programmatic ties, solar energy was also included in the review, though to a lesser degree.

Energy conservation can have several distinct meanings and a variety of Federal programs have been developed to correspond to them. Conservation can be interpreted as:

- Increased energy efficiency, such as using a car with better mileage;
- Minor lifestyle changes, such as joining a car pool; or
- Curtailment, such as reducing driving.

In the past, conservation has been most often equated with curtailment or sacrifice—"freezing in the dark." However, as the costs of energy supplies rise, EPA found that conservation is being viewed increasingly as a positive supplement to conventional supplies by all sectors of society. Many individuals, industrial corporations, and utilities are beginning to perceive investments in conservation and renewables as cost-effective alternatives to paying the rising prices of energy. For example, Southern California Edison recently decided to postpone construction of two new coal plants and to try to meet increased demand through conservation and renewable resources.

In the 1980 review, EPA examined the Department of Energy's conservation activities from three perspectives:

- Adequacy of the resource allocation process;
- Adequacy of implementation and management processes; and
- Adequacy of evaluative information on program effectiveness.

We also looked at the context within which DOE operates, including the role of the Federal government in the energy market, and the legislative and organizational history of conservation and solar programs. Some of the issues included in the 1980 program arose from concerns raised during our 1979 review. These include the need for resource allocation to be based on systematic comparisons of conservation and supply options, and the inappropriateness of certain DOE-wide management systems for conservation and solar programs.

This Report is the result of EPA analysis combined with an extensive program of public participation. In addition to a public hearing, the review included five meetings on specific topics. Over 150 people attended these meetings representing state and local governments, industry, labor, research organizations, and public interest groups. Congressional committee staff and DOE representatives also participated in these meetings. Appendix A contains summaries of these five meetings and the National Hearing.

Preceding page blank

Major Conclusions and Recommendations

The adequacy of attention to conservation must be examined in the context of overall Federal energy policy and the role of the Federal government in the energy market.

Energy is produced and consumed in a market that is heavily dependent on imported oil and that is characterized by a number of imperfections such as prices which do not reflect total costs of energy production and subsidies of certain fuels. Further, lack of information and other barriers hamper consumer decision making on energy use.

In order to overcome these imperfections and ensure that the rate at which the private sector invests in energy conservation is consistent with the national interest, there is a need for a continuing Federal involvement in providing consumers with information and, as appropriate, financial and tax incentives which will attempt to compensate for imperfections, thereby allowing renewable resource and conservation investments to compete fairly in the marketplace.

Resource Allocation Process

In the past, DOE has emphasized increasing the supply of energy without a thorough examination of the needs that give rise to the demand for energy. DOE should analyze alternative ways of meeting the energy service needs of end-use sectors by systematically comparing supply enhancement with demand reduction options. Use of an "end-use" framework would enable DOE to examine the various sectors that ultimately use energy, the needs of consumers in those sectors and the services that can satisfy those needs. This analytic framework would also sharpen DOE's current analyses of fuel supplies because it asks directly: what fuels, and how much or how little fuel for what specific services?

DOE should take the following steps to integrate an end-use framework into its planning and budget system and future evaluation efforts:

- The Energy Information Administration should calculate the current and projected energy service needs in all sectors;
- DOE's Office of Policy and Evaluation should explore the complete range of alternatives available to meet end-use sector service needs and lay out those alternatives;
- Analyses of major budget issues should contain an appraisal of how the issues affect end-use sectors' energy services; and
- The Third National Energy Plan should address end-use sector needs directly, with an even-handed treatment of how supply enhancement and demand reduction options can contribute to meeting them.

Within the end-use framework, DOE needs analytical tools to guide its cross-technology comparisons. The least-cost criterion and oil import premium should be applied to DOE's programs as part of the budgeting process.

The "least-cost criterion" calls for allocating resources to support the development and adoption of those conservation or supply options that will provide energy services at the lowest economic, social, and environmental cost. The oil import premium is a tool that enables analysts to estimate the strategic, economic, and social cost to the nation of dependence on foreign oil. When the premium is applied, it adds another dimension to cost-effectiveness projections and enables analysts to take into account the value of reducing oil imports beyond the market price per barrel.

The least-cost approach provides a useful mechanism for arraying and systematically comparing conservation and supply options. Therefore, it should be applied to the resource allocation process wherever possible. This analytical tool should be applied in addition to the other criteria used in resource allocation (e.g., the private sector's capability to undertake the task and the need for Federal intervention). Specifically, DOE should:

- Conduct a study to identify the costs and benefits of alternative strategies; and
- Develop a data base which includes environmental effects to enable DOE to apply the least-cost criterion and oil import premium at a minimum to proposed investments in conservation and supply technologies at the commercial development stage.

Implementation and Management

The Section 11 review identified two factors that have contributed to the overall implementation and management problems of DOE's conservation and solar programs: **lack of coordination and integration of related programs and inappropriate department-wide management systems.** Both of these elements grew out of the legislative and organizational history of Federal involvement in conservation and solar energy, and out of the characteristics of conservation and solar programs that distinguish them from other energy programs.

Conservation and Solar Program Integration. Rapid and piecemeal growth, combined with the decentralized nature of solar and conservation programs, have contributed to a lack of integration and coordination of conservation and solar programs. DOE has taken a significant step by combining conservation and solar programs under one Assistant Secretary. However, further integration of these programs can and should be accelerated without further reorganization within the Office of Conservation and Solar Energy (CSE).

The focus of efforts to improve the integration of conservation and solar programs should be on tasks that involve the joint participation of programs offices in comparable areas (e.g., buildings). Cooperative projects should be expanded over a two to three year period until a de facto integration by end-use sector has been accomplished.

Information Programs. Federal information dissemination programs present an example of the need for coordination of separate programs and integration of conservation and solar efforts. DOE should attempt to create an integrated conservation and solar information network within the context of DOE's overall information program, and should specify that DOE information programs include both conservation and solar information. Further, there is currently overlap and confusion among various information programs. DOE needs to define explicitly the roles of each of the major institutions involved in information dissemination.

DOE has recently taken several steps to alleviate this problem: a CSE Information Steering Committee has been formed, and oversight of information and outreach activities in CSE has been assigned to a newly established office under the Deputy Assistant Secretary for Field Operations and International Programs.

State and Local Grant Programs. The role of the Federal government in bringing about immediate energy conservation improvements is unlike any other function that Federal energy programs have served in the past, because of the highly decentralized energy conservation process and the interdependence of Federal, state and local governments. DOE should assess the strengths and weaknesses of the Federal, state and local levels in energy conservation and design strategies which build upon the particular strengths of each member of this partnership.

DOE is taking steps to improve the existing state and local programs, although concerns remain in a number of specific areas. It should also step back and review whether the state and local programs taken as a whole are adequate to the task of encouraging conservation. The impending Sunset Review should examine comprehensively the state and local programs, including the relative resource allocation among programs and how the grant programs fit into national energy conservation priorities. The review should examine the programs not only on a case-by-case basis but more importantly must assess the overall progress which the programs are making toward national objectives. A decision should be made during the review process about whether this allocation of resources offers a sensible balancing of conservation and equity considerations.

Research, Development and Applications. DOE's management systems are based largely on the experience of its predecessors — the Atomic Energy Commission, the Energy Research and Development Administration, and the Federal Energy Administration. These agencies dealt primarily with large scale, centralized technologies, and so some of their management approaches and procedures have been inappropriate for conservation and solar programs. There has been some recognition in DOE and the Congress for different processes. For example, the Approriate Technology Grant Program was created to encourage innovation among small, independent research organizations and inventors. Therefore, it has a simplified application process and a more rapid award process.

If DOE is to make a serious commitment to conservation and solar innovation, the Appropriate Technology (AT) program should receive increased emphasis. DOE should also develop systematic mechanisms for bringing the results of the Appropriate Technology and Energy-Related Inventions programs to the attention of DOE program managers and for channeling unsolicited proposals to these programs. Finally, DOE should consider establishing specialized solicitations in the AT program and should make technical assistance available to grantees.

DOE's procurement system presents particularly difficult problems for conservation and solar R&D. Alternatives to this system such as the use of cooperative agreements are available and should be employed more regularly.

Finally, DOE inherited a field structure of national laboratories from its predecessor agencies. DOE should develop an explicit policy of the use of these mutiprogram laboratories in the conservation effort. DOE has supplemented this network and added the Solar Energy Research Institute and the Regional Solar Energy Centers. SERI and the RSEC's should be given more flexibility in the conduct of their operations.

Evaluation*

Adequate information on factors affecting energy use, the achievements of energy conservation programs and the performance of specific DOE projects has not been available to

---

*Because the term "evaluation" is often used loosely to describe any formal or informal assessment of actual or anticipated results of a program, it is important to provide a working definition. For purposes of this discussion, evaluation is viewed as a formal, systematic study of the actual processes or results of a program. Evaluation is a retrospective or historical activity, examining what has occurred or is occurring. It is therefore clearly different from projections, forecasts, and other studies of proposed or hypothetical programs.

Congress, DOE officials and the public. Because of this lack of information, it has been difficult for Congress and DOE to decide how much emphasis to place on conservation programs relative to supply enhancement programs, and which particular conservation programs deserve strongest support. Although program evaluation will not provide all of the answers to these critical questions, it will make a major contribution. Therefore, DOE should take the steps necessary to evaluate systematically its major conservation and supply programs and incorporate this information into its ongoing management processes.

The Office of Conservation and Solar Energy has begun work on developing a comprehensive plan for evaluating its programs. In addition, evaluations of a number of conservation and solar programs are currently planned or in progress.

Evaluation is time-consuming, expensive and difficult to implement in many instances. The Section 11 review found virtually unanimous agreement, however, that it was essential. Therefore, EPA strongly recommends greatly increased use of evaluation. However, we have tried not to paint an overly optimistic picture. Instead, EPA has tried to develop balanced recommendations, which cite the benefits of evaluation and also raise the practical considerations that must be addressed if evaluation efforts are to be successful.

If DOE is to produce consistent information on program effectiveness, department-wide policy should be established regarding types of programs to be evaluated and criteria for program selection, department-wide information requirements, timing, roles and responsibilities of various offices, and funding mechanisms. All offices with a stake in the evaluation process should be involved in developing this policy, including state and local agencies and utilities.

Successful evaluation requires an environment that is receptive to new information and open to change. To foster this type of environment, top DOE management must demonstrate their commitment to using evaluation results and must develop incentives for good evaluation at all levels of the department such as:

- Rewarding program managers for conducting high-quality evaluations and acting upon their results;
- Establishing evaluation as a high priority activity within the Department; and
- Providing opportunities for users of evaluative information to learn more about evaluation.

Two disincentives to evaluation are inflexible legislative requirements that make it difficult for managers to change programs in response to evaluation results, and nationwide implementation of programs (such as information dissemination, standards, or state grants) without pilots or demonstrations. Changes in these two areas would encourage greater use of evaluation.

Finally, evaluations should focus not only on program impact but should also examine program processes. Evaluators should employ both quantitative and qualitative techniques in these assessments, and tailor evaluation designs to individual programs.

The 1981 Section 11 Program

This Report is part of an ongoing process. The 1981 Section 11 review will also focus on conservation and solar energy programs. In part, it will monitor the response to the 1980 program's conclusions and recommendations.

There are opportunities in the near future wherein DOE can demonstrate if any of the changes suggested in this Report are useful. These opportunities are cited in various parts of the Report and include planning and budgeting documents (required in the Planning, Programming and Budgeting System), the third National Energy Plan (due in April/May 1981), and DOE's response to the Sunset Provisions (Title X) of the DOE Organization Act (due in January 1982).

This Report is organized to allow the reader to review individual sections without loss of continuity. One cross-cutting theme that appears throughout the Report is that DOE knows much about energy supply but not enough about energy use. This departmental bias could be corrected without significant organizational changes within DOE.

Introduction

Introduction

The Section 11 Mandate

The Federal Nonnuclear Energy Research and Development Act (Public Law 93-577) was passed in December 1974 as part of the national response to the effects of the 1973 Arab oil embargo. The legislation created a comprehensive national research, development, and demonstration (RD&D) program for nonnuclear energy technologies, with total Federal investments of at least $20 billion over a 10-year period. Further, it required the development of the "... technological capabilities to support the broadest range of energy policy options through conservation and the use of domestic resources by socially and environmentally acceptable means." To ensure that this intent is reflected in the nonnuclear RD&D program, Section 11 of Public Law 93-577 directs an annual review of

> ... the adequacy of attention to **energy conservation** methods and **environmental protection** ... and the environmental consequences of the application of technologies.

The Office of Environmental Engineering and Technology within the Environmental Protection Agency's (EPA) Office of Research and Development has been assigned responsibility for the review and is charged with conducting annual public hearings and preparing this Report to the President and Congress.

1980 Section 11 Program Focus

For the past two years, the Section 11 review emphasized the environmental aspects of the mandate. In 1980, the review has concentrated on energy conservation issues. It also has included solar energy technologies because of their organizational, legislative, and programmatic links with conservation.

Conservation can have several meanings and take several distinct forms.

The first meaning for conservation is **energy efficiency**. This signifies achieving the same result or obtaining the identical service by using less energy. In this instance energy efficiency would mean driving to work in an automobile that has a higher mileage rating.

A second meaning for conservation is **life style adjustments** that do not necessarily require any reduction in activities. An example of "conservation by adjustment" would be switching from single passenger driving to joining a car pool, van-pool, or using mass transit.

Finally, it can signify using less energy by **curtailing** various activities. An obvious example of "conservation as curtailment" is the plea to reduce driving in order to use less gasoline.

Most Federal conservation programs are aimed at using energy more efficiently or saving energy with modest alterations in lifestyle. As a rule, they do not involve curtailment or sacrifice. Further, in recognition of the fact that economic consequences of increased prices will be particularly severe for low income consumers, some Federal programs are aimed at subsidizing conservation measures for these groups to alleviate the rising cost of energy.

One of the purposes of the Department of Energy, according to its Organizational Act, is "to create and implement a comprehensive energy conservation strategy that will receive **the highest priority** in the national energy program" (emphasis added). The 1980 Section 11 review has assessed the adequacy of attention to conservation and solar energy programs in three general areas: adequacy of the resource allocation process to reflect the potential contributions of Federal conservation programs, adequacy of implementation plans and management processes, and adequacy of information on program effectiveness.

EPA has not attempted to review comprehensively all of DOE's Conservation and Solar programs. Instead, we have

Preceding page blank

focused on several areas in which concerns have been raised — in the 1979 Section 11 Program, and other recent studies, or in our early discussions with program participants. Thus, **our review of resource allocation focused on the process that is used to allocate resources among program areas, not on the adequacy of the budget for Conservation, Solar, and other programs.** In implementation and management, we examined several major state grant programs, major information programs, and several issues relating to R&D — innovation, procurement, and field activities. In assessing the adequacy of information on program effectiveness, the review emphasized program evaluation.

Although the review has focused on the Department of Energy, it has also considered the context within which DOE operates, including Congress' and DOE's reasons and justification for Federal roles in the energy market, the legislative framework for Federal activity and the historical development of the Federal energy bureaucracy.

EPA has interpreted the Section 11 mandate not as a license simply to criticize but as an opportunity to develop practical recommendations for resolving identified issues. Although the primary purpose of this Report is to assess the adequacy of attention to conservation, wherever possible we have tried to develop suggestions for improvement. EPA has involved DOE in the Section 11 process from its initial stages, and hopes that DOE staff have found the process informative and useful.

The conclusions and recommendations in this Report emanate in large measure from an extensive public participation process. Almost every major constituency affected by DOE programs was invited to appear at one or more of the public meetings held this year. Participants in the Section 11 process included representatives from: more than thirty state and local government agencies; Congressional Committee staff; public utilities, private utilities and public utility commissions; trade associations; labor unions; independent research institutes; Solar Energy Research Institute; Regional Solar Energy Centers; National Labs; national, state and local public interest groups; appropriate technology community, and energy policy institutes.[*]

1980 Section 11 Program Activities

The 1980 Section 11 activities have had two components: background research and analysis of selected conservation and solar issues, and discussions of these issues with representatives of a variety of organizations, interests, and areas of expertise.

The Section 11 mandate requires that an annual public hearing be held. But EPA believes that a formal hearing does not provide an adequate opportunity for public participation in the review. Therefore, the National Hearing was supplemented by five meetings on specific issues. These meetings addressed Energy Policy Analysis (Durham, North Carolina, June 29-30), Program Evaluation (San Francisco, California, July 8-9), State and Local Assistance Programs (Minneapolis, Minnesota, July 17-18, and Portland, Oregon, July 29-30), and Research, Development and Application (Denver, Colorado, July 24-25).

Following these meetings, EPA prepared a Background Document for the National Hearing. This document presented the results of the review to date, and issues and preliminary recommendations. A notice of the availability of the document was published and public comment was solicited; EPA received comments from a number of individuals and organizations. Hearing witnesses were also invited to discuss these tentative conclusions.

The National Hearing was held September 24-25, 1980 in Washington, D.C. Thirty witnesses testified during two days of sessions. The Hearing panel included EPA officials, the DOE Assistant Secretary for Conservation and Solar Energy and three of his Deputy Assistant Secretaries, the Deputy Assistant Secretary for Conservation and Solar Policy, Congressional staff, an Office of Management and Budget official, and representatives of conservation, solar, and environmental organizations. It also included noted experts on each of the topics considered. A transcript of the Hearing will be published separately.[**]

This final Report to the President and Congress draws upon public comment, Hearing testimony, and material from the Background Document. Where tentative conclusions were supported by Hearing witnesses and follow-up research, portions of the Background Document appear in this Report verbatim.

The second chapter of the report presents our conclusions and recommendations. It outlines the **criteria** we used and it presents our **assessment** of the adequacy of attention to conservation and solar energy. Two Appendices present information to help clarify our conclusions. Appendix A presents a summary of public participation activities, including the National Hearing and the five public meetings. It also includes a list of participants in these sessions. Appendix B presents an overview of illustrative evaluations of conservation and solar programs.

---

[*] A list of participants is included in Appendix A.

[*] This transcript may be obtained by requesting a copy of the: *Section 11 National Hearing Transcript*, EPA 600/9-80-060, December 1980; from the Office of Research and Development Publications, Center for Environmental Research Information, U.S. EPA, Cincinnati, Ohio 45268

Conclusions and Recommendations

Definition of Adequacy of Attention

Although by including Section 11 in the Federal Nonnuclear Energy R&D Act Congress demonstrated its concern that conservation receive "adequate attention" in nonnuclear R&D, it did not provide a specific definition of "adequacy of attention."

"Adequacy of attention" to energy conservation for the 1980 Section 11 program was measured in three ways:

- Adequacy of the **resource allocation process;**
- Adequacy of **implementation** plans and **management** processes; and
- Adequacy of **evaluative information for decision making.**

These issues can only be examined against the current Federal roles in energy development from both a supply expansion and demand reduction perspective. Some questions that have been raised relative to this Federal role are: given the characteristics of the energy marketplace, is there a need for Federal involvement to ensure adequacy of attention to energy conservation? What is the appropriate Federal role? Adoption of energy conservation measures in the United States has been hampered more by market imperfections and institutional barriers than by lack of technological expertise. Some of these impediments are the result of Federal policies. Before presenting EPA's major conclusions and recommendations, this chapter examines the current Federal role within the energy marketplace, and how Federal actions have furthered or impeded energy conservation.

Understanding this role will provide a context against which the three criteria for "adequacy of attention" in the 1980 Section 11 program can be measured. For each of these criteria, relatively straightforward questions have been developed for assessing DOE's performance. These questions guided the 1980 review.

Resource Allocation Process

Given the technical capability of energy conservation to reduce oil imports, improve industrial productivity, and contribute to environmental and social goals, **has the potential contribution of conservation been adequately considered in DOE's resource allocation process?** What analytical tools can be utilized to help facilitate comparison and ensure that an optimal balance is achieved?

A series of recent studies* has helped to establish the contribution that conservation, supplemented by renewable resources, can make to alleviating our near term energy dilemma. Oil import reductions in the last year provide evidence that conservation has begun to work.** Two other studies still in preparation provide evidence that conservation has even greater potential than previously imagined.*** Yet DOE does not appear to have taken the potential for energy conservation into account adequately in formulating its budget.

The section on the Resource Allocation Process examines how DOE's Planning, Programming and Budgeting System (PPBS) is utilized to make resource allocation decisions. It discusses how the adequacy of attention to conservation could be improved if an end-use approach were incorporated into PPBS. The term "end-use approach" is a method for examining alternatives for supplying an energy service, such as heating or cooling of buildings, mechanical transportation and others. An-end use methodology can be important since it examines the advantages and disadvantages of both nonfuel (conservation) and fuel based options. This section then examines two analytical tools—the "least -cost" method and the oil import premium — that can facilitate more rational allocation of resources based upon systematic comparisons among all conservation and supply alternatives.

---

*See for example: Hans H. Landsberg, Chairman, et al., *Energy: The Next Twenty Years*, Report by a study group sponsored by the Ford Foundation and administered by Resources for the Future (Cambridge, Mass.: Balinger Publishing Company, 1979); National Research Council, *Energy in Transition: 1985-2010*, Final Report of the Committee on Nuclear and Alternative Energy Systems, National Academy of Sciences (San Francisco: W.H. Freeman and Co., 1979); Robert Stobaugh and Daniel Yergin, Eds., *Energy Future*, Report of the Energy Project at the Harvard Business School (New York: Random House, 1979); Roger Sant et al., *The Least Cost Energy Strategy*, The Energy Productivity Center, Mellon Institute (Pittsburgh: Carnegie-Mellon University Press, 1979); Domestic Policy Review Panel, *The Domestic Policy Review of Solar Energy*, A Response Memorandum to the President of the United States (U.S. Department of Energy, February 1979) TID-22834.

**Dr. Thomas Stelson, Assistant Secretary for Conservation and Solar Energy noted in recent testimony that "In the last 4 weeks, oil imports were down 37% over the previous year." He asserted that much of this reduction was due to conservation. Testimony of Dr. Thomas Stelson, *Oversight Hearings on the Department of Energy Conservation and Solar Energy Programs*, Committee on Science and Technology, Subcommittee on Energy Development and Applications, U.S. House of Representatives, September 9, 1980, Unpublished Committee Transcript.

***The Solar Energy Research Institute's *Solar/Conservation Project, and Conservation and Solar Strategy*. Both documents are scheduled for publication in early 1981.

Preceding page blank

Implementation & Management

Considering the history of DOE programs, the decentralized nature of the programs and the relative resources available, **how effectively has DOE implemented and managed its energy conservation programs?**

Energy conservation programs have evolved in a piecemeal fashion, largely as responses to supply disruptions and price escalations. In each year since the 1973 Arab oil embargo, Congress has passed major legislation, or the Executive branch has taken major initiatives, that affected DOE programs. Initially, the Implementation and Management Section explores the impact that this piecemeal growth of Federal programs has had on DOE programs. It examines the major areas in which a lack of integration and coordination among programs has caused significant problems for DOE and suggests approaches for improving the operation of some major programs.

The Section next traces the management implications of the fact that conservation and solar programs are significantly different from other energy programs. All of DOE's other programs are concerned with the behavior of a relatively small number of large highly organized institutions: energy utilities, power marketing agencies, suppliers of steam generators, and integrated energy companies. Solar and conservation programs, by contrast, depend predominantly on the actions of millions of individuals and small businesses, and thousands of state and local jurisdictions. Further, DOE's other programs focus primarily on overcoming technological barriers. In conservation and solar programs, while some technical R&D is needed, there is also an unprecedented need to deal with the numerous institutional and communications barriers these programs face. This has affected particularly the state and local grant programs. Compared to R&D programs, which are closer to DOE's historical experience, successful state and local programs depend on DOE's development of a new management philosophy and the use of a broader range of Federal instruments. Several new approaches, as well as suggested program improvements for both R&D and near term programs, are discussed.

Evaluative Information

Considering the importance of the choices for both resource allocation and management, **does DOE have adequate information for decision making?**

The last Section looks at evaluation of energy conservation and renewable resource programs. Because the effectiveness of these activities should be compared with supply technologies, an evaluation strategy is needed that encompasses all major technologies. The discussion reviews various uses of program evaluation, describes DOE evaluation efforts, and analyzes additional steps DOE should take to support evaluation. Finally, it explores ways of overcoming some of the major institutional and methodological barriers to evaluation.

The Role of Government

Background: The Nature of the Energy Marketplace

An assessment of the Department of Energy's "adequacy of attention" to conservation and solar energy must begin with an understanding of Federal involvement in the energy marketplace.

During the September 24, 1980, Section 11 National Hearings, participants expressed two views of the energy marketplace which appear to be contradictory. Steven C. Carhart, Assistant Director of the Mellon Institute's Office of Integrative Analysis, stated: "Energy is a commodity which is produced, used, and traded predominantly in the private sector, and as such, it is most appropriate to look at it and treat it as a commodity." Eugene Frankel, a staff member of the House Committee on Science and Technology, emphasized that energy is not a "commodity like any other commodity . . . it's a very special kind of commodity, in part because it is a natural resource and in part because it has so many health, safety, and environmental side effects, in part because . . . of the concentrated nature of the energy industry."

Both of these views are critical to understanding the role of government in the energy market. On the one hand, there is a market in which energy is produced, priced, distributed, and consumed. On the other hand, there are some characteristics that make the energy commodity different from other commodities.

During the Section 11 program, EPA attempted to delineate those characteristics of the energy market that have given impetus to various government activities. These include:

- Most of our energy is sold through a petroleum-based, substantially regulated market which is in transition to less regulation and greater use of coal and renewable resources.
- A critical part of the U.S. energy supply — oil imports — is concentrated in the hands of potentially unstable nations; the level of the nation's oil imports — about 40% of all

petroleum consumed in the U.S. — creates unacceptable economic and social strains and strategic vulnerability.

- Energy prices—for both domestic supplies and for imports — do not reflect the total costs of energy production and consumption.

- Because some fossil fuels, such as petroleum and natural gas, and electricity are not priced at their replacement value and because energy prices do not reflect the economic, social, and environmental costs of energy production and consumption, the market in the absence of government intervention undervalues the benefits of conservation and renewable resource technologies.

- The Federal government has heavily subsidized energy production and supply. A recent study indicates that these subsidies have amounted to more than $200 billion over the past 25 years.* Since the Arab oil embargo, these subsidies have increased substantially.

The next Section discusses how these current market characteristics, the demands of the transition to a less regulated, less petroleum-based market, and the security and welfare interests of the United States have contributed to shaping the Federal role.

Government's Role in Conservation

Certain conservation investments may be the most cost-effective way to deal with the strains and vulnerability of existing forms of energy supplies. It reduces the need for oil imports; relieves pressure on oil prices; increases U.S. economic efficiency; extends the U.S. supply of fossil fuels; and reduces pollution. Residential, commercial, and industrial energy consumers have increasingly made investments in conservation and solar technologies. As a response to rising energy prices and with each increase in OPEC prices, these investments become even more cost-effective. Even so, investments in conservation and solar technologies are not taking place at a rate consistent with the nation's economic or strategic welfare for a number of reasons. For example, some energy consumers do not have sufficient information about the benefits of conservation investments or about the range of options available to promote energy efficiency.

Federal energy policy has evolved as a series of efforts to respond to market imperfections and international crisis. The Federal role appears to be in transition from an emphasis on managing the marketplace to complementing market forces and addressing those issues the market does not. Five elements that characterize this changing Federal role are:

1. To respond to the problems of strategic vulnerability posed by the control of oil imports by OPEC countries, the government has attempted to: adopt policies to encourage oil import reduction; provide market incentives to encourage the development of alternative energy sources; diversify the sources of oil supply; provide a supply buffer to smooth the effects of disruption; and plan for disruption and the ensuing need to allocate supplies to essential uses.

2. Since energy prices do not reflect the total costs of production or consumption, the government has attempted to encourage greater efficiency in the production and consumption of resources. Policies consistent with this function include: encouraging state utility regulatory agencies to require the adoption of marginal cost pricing of electricity; and requiring that U.S. energy producers and users bear the costs of environmental degradation associated with the production and consumption of energy.

3. Since conservation is undervalued in the marketplace and therefore is an incompletely tapped source of energy, the government has attempted to encourage consumers to invest in conservation at a rate which is in the nation's security and economic interests. For example the government has provided information about the benefits of conservation; reduced market barriers to these investments where they exist; provided financial and tax incentives to encourage the rapid application of conservation techniques; and provided financial assistance to ensure that low income individuals and marginal businesses can avail themselves of the benefits of conservation investments.

4. The private sector can devote only a portion of its funds to research, development, and high risk demonstration projects. Also, the activities the private sector chooses to engage in may not be the activities required by the nation overall for its long-term health and security. Therefore, the government has sponsored research and development and encouraged the private sector to invest in the commercial development of alternative fuels and renewable resources.

5. While the distribution of the nation's income is not strictly an energy problem, income redistribution caused by rising energy prices is the result of both Federal policies and the workings of the energy marketplace. Therefore, government policy has tried to deal with the equity problems that result from higher energy prices, through programs such as the Weatherization Assistance Program, and the conservation grant program of the new Solar and Energy Conservation Bank.

Despite differences of opinion on the ultimate ability of the energy market to resolve energy problems, virtually all Section 11 participants maintained that there was a need for an active Federal role now and in the foreseeable future.

As former DOE Assistant Secretary for Policy and Evaluation Alvin L. Alm stressed during the Section 11 National Hearings, "it will take decades to create a true energy market"

---

*Bruce Cone, *An Analysis of Federal Incentives Used to Stimulate Energy Production*, Battelle Pacific Northwest Laboratory (Richlands, Washington, February 1980), PNL 24-10, Revision 2.

and meanwhile "market forces alone will not achieve an optimum conservation level." Therefore, participants in the 1980 Section 11 program emphasized that because the market has undervalued and continues to undervalue conservation and renewable technologies, the government should pursue vigorously programs to promote conservation and renewable resources. These programs should focus on providing consumers with information and, as appropriate, financial and tax incentives which will attempt to compensate for imperfections, thereby allowing renewable resource and conservation investments to compete fairly in the marketplace.

Since market forces will not achieve an optimum level of conservation, Federal actions in each of these areas appear necessary to reflect the national interest in conservation. However, the existence of a Federal policy or activity in each of these areas does not ensure "adequacy of attention." The next sections examine three aspects of adequate attention: the method by which DOE allocates resources to energy conservation, the management and implementation of selected DOE conservation and solar energy programs and the availability of evaluative information for decision making.

Assessment of the Resource Allocation Process

Overview

Given the technical capability of energy conservation to reduce oil imports, improve industrial productivity, and contribute to environmental and social goals, has the potential contribution of conservation been adequately considered in DOE's resource allocation process? What analytical tools can be utilized to facilitate comparisons of supply and conservation technologies?

Since its creation, DOE has focused on increasing fuel supplies rather than on analyzing the needs that give rise to energy use (such as comfortable houses, personal mobility and the like) and comparing alternatives for meeting those needs.

DOE's Planning, Programming, and Budgeting System should provide a forum for systematic comparisons among supply enhancement and demand reduction alternatives to achieve an appropriate balance. This section explores the process DOE uses to allocate resources and how an end-use orientation and two analytical techniques—the least cost method and an oil import premium—would facilitate cross-technology comparisons within this process.

Background

This past year, DOE adopted a Planning, Programming, and Budgeting System (PPBS) to help allocate departmental resources. The purpose of PPBS is to provide DOE policymakers with the information needed to make informed decisions about the direction of programs and to make trade-offs between programs.

The PPBS establishes a formal schedule of documents to be used in setting funding levels for various programs, and dates upon which those decisions are to be made. Two characteristics of PPBS design are especially important to our assessment of DOE's conservation and solar programs.

First, PPBS emphasizes the use of analysis and, in particular, the estimation of the benefits and costs of programs; that permits divergent programs to be compared in terms of the same units. Second, PPBS can highlight trade-offs between programs, and it can make trade-off decisions the responsibility of high-level administrators.

DOE has made progress during this PPBS implementation year in estimating the benefits and costs of Federal energy programs and in recognizing the need for ongoing and strengthened program evaluation activities. However, many participants in the 1980 Section 11 program stressed that DOE could improve its ability to make resource allocation decisions if better means were available within PPBS to reveal the contributions of programs aimed at oil import reduction and their relative effectiveness in meeting energy consumers' needs at reasonable costs.

It appears that the PPBS is superior to DOE's earlier systems to allocate resources. DOE's management has devoted a great deal of time and effort to developing and implementing PPBS, and it is a significant improvement. In EPA's view, however, **it has not incorporated the systematic, explicit comparisons of alternatives that would ensure adequacy of attention to conservation and an optimal balance among supply and conservation programs.**

Three analytic aids explored by the Section 11 review—an end-use sector framework, a least-cost method and an oil import premium—could improve DOE's ability to make these comparisons. All three concepts can be used directly in the PPBS, and have actually been used to a limited extent already. However, a more concerted application of these concepts within the current PPBS system would not only improve the quality of the analysis used in the system, but would also help ensure that DOE gives "adequate attention" to conservation and solar programs. The remainder of this section discusses how the resource allocation process can be improved — it does not discuss the adequacy of specific budget levels.

End-Use Sector Framework

In the past, DOE has emphasized increasing the supply of energy without sufficient examination of the exact nature of the needs that give rise to the demand for energy in various end-use sectors. DOE should incorporate an analysis of alternative ways of meeting the energy service needs of end-use sectors into its PPBS process and its analyses for the third National Energy Plan (NEP-III).

While DOE, since its creation in 1977, has legitimately concerned itself with ensuring that the nation has dependable fuel supplies, it has not explored comprehensively the nature of consumers' energy needs. In other words, DOE has been preoccupied with the supply of energy to the exclusion of a thorough examination of the needs that give rise to the demand for energy. DOE has not fully analyzed the services (like mechanical motion or artificial lighting) that fulfill those needs, nor the alternative ways by which such services can be provided. It has not collected the data on which these analyses must rest. It has not evaluated its programs in terms of their effects on energy services. Finally, it does not allocate its Department-wide resources according to an overall strategy that takes full account of the needs of various end-use sectors.

EPA believes that if greater consideration were given to consumers' energy needs within each sector and the alternative ways by which energy services could be provided, the benefits of conservation and other environmentally advantageous approaches would become more apparent. It might turn out, upon examination, that a vast array of needs could be better satisfied by improving energy efficiency instead of expanding its supply. Therefore, in this year's Section 11 program, EPA considered ways to broaden DOE's policy and programmatic focus and increase its attention to energy needs.

Participants in the Section 11 program suggested that **DOE should conduct a portion of its analyses within an "end-use sector" framework.*** This analytical framework requires: (1) a division of the economy into the various sectors that ultimately make use of energy; and (2) an orientation of analyses towards the needs of consumers in those sectors and the services that can satisfy those needs.

DOE already has some experience with an end-use orientation. Its conservation and solar programs have been reorganized along end-use lines and it has attempted to build program strategies in these areas around end-use sector needs. However, if the framework is to have the desired effect of promoting explicit cross-technology and cross-fuel comparisons, then DOE must implement the framework on a Department-wide basis — not as an organizational structure, but as a tool of analysis within PPBS.

An end-use analytical framework, integrated with DOE's planning and budgeting system, should contain the following elements:

- A detailed specification of the end-use sectors. Currently, the major sectors are assumed to be transportation, utilities, commercial and residential buildings, and industry. However, the subdivisions and boundaries of these sectors have not been well distinguished;
- The identification of consumers' energy needs within each sector;
- The exploration of various ways of meeting those needs, including alternative fuels and non-fuels techniques;
- The calculation (using varying methodologies) of the social, economic, and environmental costs and benefits of meeting those needs, including an assessment of how each alternative impacts on oil import reduction; and
- The use of analytic tools (such as the least-cost criterion and oil import premium described in the next section) to compare the relative cost-effectiveness of alternative actions, their relative contributions to oil import reduction, and the efficiency of the system by which they would be delivered.

The advantages of such a framework are many. First, it would facilitate a fair hearing for conservation and solar energy because DOE policy analysts and management could explicitly examine whether conservation and solar options exist to meet end-use needs and how those options compare to the employment of conventional fuel sources. The end-use framework would also sharpen DOE's current analyses of fuel supplies because it asks directly: what fuels and how much fuel for what services? The framework could, moreover, encourage DOE to evaluate more thoroughly the environmental consequences of alternative supply technologies and their implications for consumer costs. Finally, the framework requires that DOE deepen its understanding of energy consumers' decision making and the factors that potentially influence energy demand. Without this kind of understanding, DOE will continue to find it difficult to design effective market incentive programs to encourage desirable energy investments.

---

* In the 1979 Section 11 program, the advantages of an end-use orientation in setting priorities among programs was discussed. This approach was contrasted with a reliance on econometric models to predict energy demand.

The implementation of this analytical framework would be complex but ultimately feasible. DOE should take the following steps to integrate the end-use framework into the planning and budgeting system and future evaluation efforts:

- The Energy Information Administration (EIA), working in conjunction with DOE's program areas (Resource Applications, Fossil Energy, Solar, Conservation, and Nuclear) should continue to define the end-use sectors. Further, **EIA should calculate the current and projected energy service needs in all sectors.** This goes beyond the activities EIA currently conducts because it requires detailed information about energy demand and behavior on a sector-by-sector basis.

- In conjunction with the program offices, **DOE's Office of Policy and Evaluation should explore the range of alternatives available to meet end-use sector service needs and lay out those alternatives.** This should be followed by a comprehensive study of the economic, social, and environmental costs of those alternatives. A critical component of the study would be to assess the adequacy and dependability of fuel supplies needed under each alternative.

- **DOE's Office of Policy and Evaluation should develop guidelines for the FY-83 to FY-87 budget process** to help program areas analyze program and budget plans in light of end-use sector energy needs. The Office of Policy and Evaluation should detail these guidelines in its Policy, Programming and Fiscal Guidance Document.

- The Office of Policy and Evaluation's Secretarial **decision memoranda on the major budget issues should contain an appraisal of how the issues affect end-use sectors' energy services** in addition to how the issues affect fuel supplies.

- The Third National Energy Plan **(NEP-III), currently in preparation, should address end-use sector needs directly** across-the-board. It should explain how these needs will be met by the programs in the plan and what the role of conservation and renewable resources will be in meeting them.

Finally, EPA recommends that the Congressional Budget Office and other Congressional analytical staffs also examine proposed energy incentives and ongoing programs in terms of their effects on energy consumers' service needs as well as their contributions to fuel supplies.

Analytical Tools

Within the end-use framework, DOE needs analytical tools to guide cross-technology comparisons. The least-cost criterion and oil import premium should be applied to DOE's programs as part of the budgeting process.

This section now turns to an examination of two analytic tools that can be used within an end-use framework to guide DOE's resource allocation process: first, the least-cost energy criterion, which would help DOE set priorities among cost-effective supply expansion and demand reduction energy programs; and second, the oil import premium, which would allow DOE to measure the cost-effectiveness of energy investments against their potential contributions to reducing U.S. oil import dependence.

The Least-Cost Criterion

Participants in the Section 11 program suggested that DOE use a "least-cost" criterion to help set priorities among alternative programs. This criterion calls for **allocating resources to support the development and adoption of those conservation or energy supply options that will provide energy services at the lowest economic, social, and environmental cost.** Its use within PPBS and the end-use sector framework can help DOE determine which proposed programs are most deserving of Federal support, and gauge the relative cost-effectiveness of current programs. Instead of examining programs primarily from the perspective of technological feasibility, this approach would also require careful consideration of the eventual usefulness and cost-effectiveness of the products of the programs. This approach would be applied in addition to other criteria, such as the appropriate Federal role.

It is important to define clearly the concept of least cost. By "least-cost" we mean least **total** cost to the nation, including the environmental and social costs of energy supply enhancement. These factors have tended not to be considered. It should be emphasized that the least-cost criterion is not the same as the simple recommendation to choose the least expensive energy service or supply option. Instead, it requires DOE to calculate the external costs as well as the economic resource costs of various alternatives for providing energy services, and then to give priority to those whose total costs will be least. The advantage of the least-cost criterion in this respect is that it requires that assumptions about energy service needs, acceptable means of meeting needs, and costs be made explicit.

EPA also distinguishes the least-cost criterion as an analytic tool from the "least-cost strategy" developed by the Mellon Center for Energy Productivity. During the Section 11 hearings, representatives of the Mellon Institute argued that national energy policy should be directed towards one overriding objective: the provision of needed energy services to consumers at the lowest possible cost. They argued that by following this approach, the various objectives now guiding energy policy — the reduction of oil imports in particular — could be achieved more efficiently if they were pursued directly. The translation of the Mellon theoretical model into practice at DOE, however, could require more changes in the way policy is made than are achievable in the short run.

Neither DOE nor the Congress has made much use of a least-cost approach in shaping policy, proposing new programs, or evaluating ongoing programs.[*] One reason is that least-cost is not the only acceptable criterion for allocating resources, and other criteria have been given greater emphasis. As DOE recently told the House Committee on Science and Technology: "A high benefit-cost ratio does not automatically dictate government action or major Federally funded research and development where the scale of required research, low private incentives, great uncertainties, or critical national security interests dictate that private sector actions will be inadequate."

Furthermore, given the lack of existing data about consumer behavior, the effects of Federal programs, and the social and environmental impacts of untested commercial-scale energy supply programs, it is difficult for DOE and the Congress to identify, quantify, and project all the relevant economic, social, and environmental costs of proposed actions.

EPA recognizes that application of the least-cost criterion is no simple matter. Nevertheless, this **approach provides a useful mechanism for arraying and systematically comparing demand reduction and supply enhancement options, so EPA advocates that it should be applied along with other factors to resource allocation decisions wherever possible.** Specifically, DOE should:

- **Conduct a study to identify the costs and benefits of alternative strategies** for reducing oil imports, ensuring adequate energy supplies, and meeting the current and projected needs of energy consumers as part of NEP-III. This study should identify the gap between the least-cost and existing strategies for meeting DOE objectives. Where significant gaps exist, DOE should review whether there are compelling reasons for maintaining existing strategies and, if appropriate, define new policies and programs for meeting consumers' energy service needs.
- **Develop a data base,** through EIA and program office studies, **which will enable DOE at a minimum to apply the least-cost criterion to proposed investments in conservation and energy supply technologies at the commercial development stage. DOE should emphasize the development of data on the environmental effects of energy supply technologies,** and apply that data in determining the least-cost alternative.
- **Increase efforts to apply the least-cost criterion when evaluating specific budget and program plans within PPBS.** The Office of Policy and Evaluation should provide program offices with guidance on cost and benefit estimation, with particular emphasis on how to account for environmental and equity impacts.

The Oil Import Premium

A major thrust of U.S. energy policy is the reduction of oil imports because reliance upon imported oil imposes high strategic, economic, and social costs upon the nation. The "oil import premium" represents an attempt to estimate those costs. It is, strictly speaking, the cost in excess of market price of importing an additional barrel of oil. It places an upper limit on how much the U.S. should be willing to pay, over and above the world oil price, to reduce oil imports. It therefore provides a measure of cost-effectiveness against which individual programs can be assessed.

EPA recommends use of the premium as an analytic tool.[**] If applied in the resource allocation process in conjunction with the least-cost criterion, the premium would provide a cut-off point for determining the value the government should place on oil import reduction programs. As less expensive options are exhausted, the premium provides guidance on the cost-effectiveness of programs. It would lead to more careful analysis of programs where per barrel cost approaches or exceeds the world oil price plus the premium. For example, in assessing the cost-effectiveness of a residential audit and retrofit program, the cost of the program (measured in terms of dollars per barrel of oil saved) would be compared to the world price of oil plus the oil import premium. If the program's cost exceeds the bound set by the premium, then it should be scrutinized to determine whether it should be continued. A program that is not cost-effective on these grounds may be justified for other reasons, such as equity goals, but this justification must be made explicit.

---

[*] DOE's current programming and fiscal guidance mandates that the "lowest cost options should be exhausted first," but this does not reflect the comprehensive concept of "least-cost" recommended here (U.S. Department of Energy, *Draft Policy, Programming and Fiscal Guidance for FY-82-86*, January 1980, p. 15.)

[**] The premium concept has also been suggested in conjunction with a tax on imported oil. EPA has not included this potential use of the premium in the Section 11 review.

DOE recognizes the oil import premium is a valuable tool for judging whether oil import reduction programs are cost-effective. As stated in the DOE **Draft Policy, Programming, and Fiscal Guidance for FY 1982-1986,** "A single measure of the benefits of reducing imports should be applied consistently over all programs." However, because premium estimation work was still in a preliminary stage during this PPBS implementation year, DOE did not explicitly use the premium tool in this year's planning and budget process.

Analysts, both inside and outside of DOE, have been working to refine the premium concept for the past several years. The current state of the art in estimating the premium was discussed at two conferences held in October 1980: the Conference on the Oil Import Premium, sponsored by DOE; and the Second Annual North American Meeting of the International Association of Energy Economists.*

There are difficulties in calculating the premium. The calculations are contingent upon a number of issues that cannot be resolved conclusively, including: the reaction of OPEC nations to the import reduction policies adopted by the U.S. and other nations; and the basic economic parameters used in these calculations, such as growth rates for the economy, and discount rates. However, in spite of the varying assumptions made, independent estimates of the oil import premium fall in a narrow range, with the premium applicable to long run import reduction ranging generally from $4 to $15 per barrel (with some estimates more than twice that).

In addition to quantification problems, there are a number of other difficulties in applying the premium concept to aid program analysis. Relating Federal programs in basic research to reduced oil imports will be difficult. The uncertainties inherent in long term research and development projects are generally very large and estimates of the expected benefits from such projects are usually reported as a wide range. Once research projects reach the stages of demonstration and commercial development, however, their uncertainty is reduced and the premium becomes a revealing aid to policy making. The premium, therefore, could be applied to the appraisal of synthetic fuels production and demonstrations of innovative enhanced oil recovery methods.

Another problem is that the benefits of some programs are difficult to calculate because there is not enough information to evaluate their impacts. For example, there is insufficient information to estimate the effect of solar technology tax credits on the use of oil. Often, it is difficult to assess the effect of a program because it is almost impossible to tell what would have happened in its absence. In general, DOE can profitably use the premium to analyze programs only when the benefits of those programs can be estimated with reasonable precision. Therefore, the use of the premium could increase substantially as program evaluation improves.

To conclude: As Alvin L. Alm stated during the Section 11 National Hearings, "We still have some distance to travel before an analytically sound and generally accepted import premium is available. Even when we can agree on such a measure, its application in the real world is complex." Although the methodology for calculating the premium is still evolving towards greater sophistication and soundness, **DOE should apply the premium concept to the extent feasible as part of its preparation for the next fiscal year's budget and NEP-III.** To apply the premium, DOE will have to increase its efforts to develop the data needed to calculate with reasonable precision the benefits and costs of conservation, renewable resources, alternative coal-based fuels, and conventional fuels. Accomplishing this objective will require a higher priority for program evaluation.

---

*At these meetings, in addition to discussion of the oil import premium, there was also consideration of a "supply disruption premium" and a "stock pile premium." EPA has not included the two latter concepts in its recommendations.

Assessment of Implementation and Management

Overview

Considering the history of DOE programs, the nature of the task, and the relative resources available, how effectively has DOE implemented and managed its energy conservation and solar programs?

The Office of Conservation and Solar Energy (CSE) has had difficulty adapting a management system designed to promote centralized supply technologies to decentralized conservation and solar processes. The inappropriateness of some aspects of DOE's department-wide management systems has affected both R&D and state/local grant programs. Conservation and solar R&D could benefit by increased emphasis on innovation, and more flexibility in procurement operations. To maximize the effectiveness of the grant programs, DOE needs a new management approach which is built upon a partnership among Federal, state, and local level agencies.

CSE's management and implementation problems have been compounded by the piecemeal growth of conservation and solar programs. Increased coordination and program integration would improve CSE programs as a whole.

Background

There have been significant achievements in DOE's conservation and solar energy programs; at the same time the Section 11 review identified two factors that have contributed to overall implementation and management problems of DOE's conservation and solar programs: **lack of coordination and integration of related programs** and **inappropriate department-wide management systems.** Both of these elements grew out of the legislative and organizational history of Federal involvement in conservation and solar energy, and out of the characteristics of conservation and solar programs that distinguish them from other energy programs.

Legislative History

From FY-74 to FY-80, growth in the Federal conservation and solar effort has been significant. Programs in these areas have multiplied rapidly and budget outlays to support their activities have increased substantially. Much of this growth has resulted from Congressional actions rather than Executive Branch initiatives. In addition to the regular agency authorization and appropriation bills Congress has enacted, major pieces of conservation and/or solar legislation have been passed in each of the last seven years. Most of this legislation created at least one new program (see Figure 1).

In many respects, this proliferation of programs represents unplanned growth. By and large, these new initiatives were created as a response to a series of crises, and taken as a whole, they do not necessarily provide a coherent framework for achieving national energy goals.

In some areas, inadequate attention has been devoted to integrating and coordinating these disparate programs. Efficiency of operation and effectiveness of programs would be enhanced if conservation and solar were more closely integrated, and related programs, such as information dissemination efforts, were better coordinated.

Organizational History

In 1977, energy activities from ERDA, FEA, and six other agencies were combined into a cabinet-level Department of

Figure 1

MAJOR FEDERAL LEGISLATIVE INITIATIVES AFFECTING CONSERVATION AND SOLAR ENERGY

Year	Legislation	Description
1974	**Energy Reorganization Act**	Split functions of the AEC between the Nuclear Regulatory Agency and ERDA. Public Law 93-438
	Federal Nonnuclear R&D Act	Established ERDA and called for a $20 billion, decade-long effort in nonnuclear energy R&D. Public Law 93-577
	Solar Energy RD&D Act	Authorized a broad program of renewable energy RD&D . . . established the Solar Energy Research Institute . . . established the Solar Energy Information Data Bank. Public Law 93-473
	Solar Heating and Cooling Demonstration Act	Mandated a demonstration program for residential and commercial active solar applications . . . established the National Solar Heating and Cooling Information Center. Public Law 93-409
1975	**Energy Policy and Conservation Act**	Established fuel efficiency standards for automobiles and energy efficiency standards for appliances . . . authorized for State Energy Conservation Program . . . established programs for energy efficiency in Federal agencies. Public Law 93-163
1976	**Energy Conservation and Production Act**	Mandated the development of Building Energy Performance Standards . . . established Weatherization Assistance Program . . . amended the State Energy Conservation Program. Public Law 99-385
1977	**DOE Organization Act**	Established conservation as a major function within the new DOE, consolidating conservation programs from other Federal agencies. Public Law 95-91
1978	**National Energy Conservation Policy Act**	Authorized the Residential Conservation Service . . . established the Institutional Buildings Program . . . established programs for solar and conservation applications in Federal buildings. Public Law 95-619
	National Energy Tax Act	Created income tax credits for investments in business and residential conservation and renewable energy. Public Law 95-618
	Public Utility Regulatory Policy Act	Required utilities to establish buyback rates for power generated by customers, including power from renewable sources. Public Law 95-617
	Photovoltaic RD&D Act	Set goals and authorized funds for an aggressive, decade-long photovoltaics RD&D program. Public Law 96-223
1980	**Crude Oil Windfall Profits Tax Act**	Increased residential and business tax credit for solar energy. Public Law 95-590
	Energy Security Act	Mandated stepped-up programs to demonstrate and commercialize biomass energy technologies . . . established the Solar and Conservation Banks . . . expanded the RCS to include commercial and multifamily buildings . . . authorized grants for state training programs for energy auditors . . . expanding tax credits. Public Law 96-294

Energy. The new department had nine major functions, including atomic energy defense activities; commercial applications of nuclear power; basic nuclear science research; regulation of interstate sale and transmission of electricity and natural gas; regulation of petroleum allocation and price controls; power marketing; fossil energy development; energy conservation; and renewable energy. It is important to note that each of these activities, except conservation and solar, had already developed into a substantial program before incorporation into DOE.

When DOE was created, it established internal management systems and procedures to govern all of its programs that were adapted largely from its predecessors. In many ways, however, the AEC/ERDA systems have turned out to be inappropriate for conservation and solar programs. This chapter assesses how these procedures have affected state grant programs and certain aspects of conservation and solar R&D.

Characteristics of Conservation and Solar Programs

Conservation and solar programs exhibit several characteristics that make them quite different from other energy programs DOE supports. These include:

- **user.** While fossil and nuclear programs can be technically successful if the hardware produced by a small number of manufacturers and architect and engineering firms is purchased by a relatively small number of users, the success of most conservation and solar programs depends on the actions of numerous individuals and local communities.
- **diversity.** Conservation and solar programs encompass an enormous diversity of processes, products, methods, etc., whereas most DOE programs include only a few potential approaches to given technical problems.
- **scale.** Most conservation and solar technologies are of much smaller scale than other DOE programs.
- **regionalism.** The potential application of specific conservation and solar techniques varies by region. Few other DOE programs exhibit this characteristic.

These characteristics have important implications for the implementation and management of DOE's conservation and solar programs which are discussed later in this chapter.

This section discusses how the two overall problems cited earlier — the lack of integration and coordination and inappropriate department-wide management approaches — have affected DOE's adequacy of attention to implementation and management of conservation and solar programs in general, and specific problems that have arisen in individual programs. Under lack of integration and coordination we discuss the need for:

- Greater integration and coordination of conservation and solar programs overall; and
- Coordination of information dissemination programs.

Under inappropriate department-wide management approaches we discuss the need for:

- A new management philosophy that recognizes the crucial role of states and local agencies in conservation and solar development and implementation; and
- Alternative management systems for conservation and solar R&D to more effectively encourage innovation and respond to the characteristics of conservation and solar energy.

Integration of Conservation and Solar Programs

Rapid and piecemeal growth, combined with the decentralized nature of solar and conservation programs, have led to a lack of integration and coordination. DOE has taken a significant step by combining conservation and solar programs under one assistant secretary. Meaningful integration of these programs can and should be accelerated without further reorganization within CSE.

Conservation and solar energy are closely related on a number of levels. The similarities they exhibit and their close operational ties provide many reasons for coordinating conservation and solar programs.

First, both are primarily decentralized approaches. For conservation and solar energy to contribute significantly to national energy needs, millions of individuals will have to make decisions to use energy more efficiently or shift to renewables.

Second, many solar and conservation technologies are integrally related. For example, in building applications, it is inefficient to install an expensive solar heating system on a poorly weatherized building. Similarly, most new residences can use less energy by incorporating passive solar design as well as standard energy conserving features.

Third, energy conservation and solar activities will require similar infrastructures, particularly in the residential/commercial sector. For example, the building industry will have the primary responsibility for making new homes and office buildings more energy efficient, and for incorporating passive solar features in new construction.

Finally, both conservation and solar will reduce the demand for conventional energy, or at least reduce the rate of growth in energy use. Consequently utilities will need to plan for integrating these new sources into their plans to install new central generating capacity.

Until DOE was created there were few ties between the Federal government's conservation and solar programs. In ERDA, there was one Assistant Administrator for conservation and a separate Assistant Administrator for solar, geothermal, and fusion energy. ERDA's premise was that solar energy was a new energy source, and as such, it was housed with other "production technologies," rather than with conservation.

The split between the two was only partially alleviated when the Department of Energy was created in October, 1977. Initially, DOE was organized primarily by functional categories that corresponded to stages of technology development: basic research, technology development, and commercialization. All conservation activities were deemed to be ready for commercialization, so these technologies, along with solar heating and cooling, industrial process heat and solar commercialization activities, were assigned to an Assistant Secretary for Conservation and Solar Applications. All other solar technologies — wind, biomass, photovoltaics, solar thermal and ocean thermal — were assigned to the Assistant Secretary for Energy Technology, along with nuclear fission, magnetic fusion, geothermal, synthetic fuel and coal technologies. As most solar technologies approached commercial viability, it was expected that they would be transferred to Conservation and Solar Applications or an Assistant Secretary for Resource Applications.

The most recent reorganization combined solar programs with conservation under an Assistant Secretary for Conservation and Solar Energy. Solar technologies were grouped by end-use applications: buildings, industry, and utilities, as were conservation technologies.

Although conservation and solar are now organized under the same Assistant Secretary, the separate parallel structures for each have resulted in a continued lack of adequate programmatic integration. The intended coordination between programs in these two branches is, for the most part, incomplete; contact occurring between corresponding offices is spotty. This lack of program integration means that solar and conservation offices set separate goals, pursue different activities, and fail to take the impacts and possible benefits of the other technologies into account sufficiently. In the residential buildings area, for example, the impact of conservation technologies on home heating demand substantially affects the size and type of solar systems that are being developed to provide space heat.

DOE has taken some recent steps in the right direction. These include the ongoing SERI "Solar and Conservation Project." This study is examining how 20% of U.S. energy needs can be supplied from renewable sources by 2000 in the context of enhanced energy efficiency.

There are significant steps, short of reorganization, that CSE can take to improve the integration of conservation and solar programs. **The focus of these efforts should be on increasing the joint participation of program offices in comparable end-use areas (e.g., buildings). Cooperative projects should be expanded over a two- to three-year period, until a de facto integration by end-use sector has been accomplished,** at least for the R&D programs.

An example of how this might work is given in the Report of the House Committee on Science and Technology accompanying the proposed FY-81 DOE authorization bill. The Committee recommended adding 2.5 million to the administration request for developing and testing passive/hybrid commercial buildings; added $0.5 million for an analysis of the relation ship between conservation and solar within buildings, continuing the work begun in this area by the solar group at Los Alamos Scientific Laboratory; and directed that a new Hybrid Building activity be created in the Market Test and Applications area. These additions, $5 million of existing activities and $2.5 million from conservation programs, would be transferred to this new activity. The Committee also directed that DOE prepare a plan to fully integrate solar and conservation programs, particularly in the buildings sector. The recommendations in the Science Committee report contain useful ideas for improving the ties between solar and conservation programs.

Coordination of Information Programs

There is currently overlap and confusion among various separately-created information programs. DOE needs to explicitly define the roles of each of the major institutions involved in information dissemination, and integrate and coordinate solar conservation information activities.

One of the principal market imperfections identified in earlier sections of this Report is lack of information needed by consumers to make energy-related decisions. Individual homeowners and small businesses are at a particular disadvantage, especially when compared with industry. Most large companies have corporate energy managers, large accounting staffs, and well-developed criteria for making economically rational decisions. Homeowners and small businesses, on the other hand, are frequently unaware of the economic advantages of energy saving investments. Most households have little experience with rate-of-return computations or payback calculations, much less lifecycle costing procedures. But useful economic data is only one type of information that should be available to homeowners and small-business people. They also need to know where they can find knowledgeable contractors, architects or builders. If they do the work themselves, they need access to materials, equipment and suppliers. Finally, they need to be aware of the warranties or guarantees that are offered for products and services.

Congress and the Federal government have recognized the importance of information to the widespread adoption of cost-effective conservation and solar measures. At least 13 separate Federal agencies and departments currently conduct outreach and dissemination activities. These information components of programs have developed piecemeal, however, rather than from a comprehensive Federal plan. For example, five major programs that contain information services were authorized in five separate pieces of legislation (see Figure 2 for descriptions of these programs):

- National Solar Heating and Cooling Information Center (NSHCIC), from the Solar Heating and Cooling Demonstration Act of 1974;
- The Solar Energy Research Information Data Bank (SEIDB), authorized by the Solar Energy Research, Development and Demonstration Act of 1974;
- The Energy Extension Service (EES), created by the EES Act of 1977;
- The information program of Residential Conservation Service (RCS) created by the National Energy Conservation Policy (NECPA) of 1978; and
- The promotional program Solar and Energy Conservation Bank, authorized by the Energy Security Act of 1980 (located in the Department of Housing and Urban Development).

In addition to these information activities established through legislative mandate, DOE operates a series of other solar and conservation programs with information components. These include information activities of the four Regional Solar Energy Centers (RSECs), and the President's Clearinghouse on Community Energy Efficiency. Many of DOE's program offices also disseminate information on their programs in response to consumer inquiries.

Although there have been efforts to avoid overlap and duplication as these programs were created, problems have arisen in their implementation. Because these information programs were developed piecemeal, the roles of the principal institutions have not been carefully defined. Some of these roles have been assigned by legislation; others have been added incrementally by DOE; still others have been developed by the organizations themselves. In addition to causing overlap and duplication, the lack of explicit demarcation of organizational mission can lead to "turf" struggles, diverting resources from the substantive mission of each organization. Moreover, it can cause confusion within DOE, Congress and the general public, which can undermine support for information programs.

DOE has recently taken a number of constructive steps to alleviate this problem. In June, 1980, the Assistant Secretary for Conservation and Solar Energy chartered a CS Information Steering Committee "to ensure that Conservation and Solar Energy information activities are effectively managed and that program resources are appropriately used." In November, 1980, DOE formally approved establishment of an office, reporting to the Deputy Assistant Secretary for Field Operations and International Programs for "developing policies and providing oversight and management of information dissemination and outreach activities within CS."

With the large number of institutions involved in information dissemination, the need for coordination is obvious. In recognition of this need, Title IV of the Energy Security Act requires "the Secretary of Energy to coordinate solar and conservation information dissemination activities funded by DOE, including a summary of how DOE services are coordinated with the services of other agencies." DOE's report in response to the congressional mandate will be completed early in 1981.

DOE can utilize this report to explicitly define the roles and responsibilities of each of the major institutions, so that each organization has a distinct role.

In its efforts to clarify roles and responsibilities, **DOE should specify that programs include both conservation and solar information.** The lack of coordination between solar and conservation information programs reflects the general lack of integration of solar and conservation programs which was discussed in the previous section. Solar and conservation are clearly complementary, yet information programs do not reflect this close relationship. For example, NSHCIC has only recently received permission to give consumers information about home weatherization, and conservation programs such as the RCS are including solar only because of pressure from solar activist groups to include solar in legislation and regulations.

Figure 2
MAJOR FEDERAL CONSERVATION AND SOLAR INFORMATION PROGRAMS
Established by Legislation

Program	Description
National Solar Heating and Cooling Information Center (NSHCIC) **Public Law** **93-409** **1974**	NSHCIC operates a series of nationwide toll-free hotlines to respond to individual consumer requests for information about active and passive solar heating systems. In its four years of operation, NSHCIC has reponded to more than 500,000 inquiries and mailed more than seven million pieces of literature. An FY-80 budget of $4 million funds information research activities, workshops, and traveling exhibits in addition to the "Hotline." NSHCIC is operated by the Franklin Research Corporation for the Department of Housing and Urban Development. Funds are supplied to HUD by DOE through an interagency agreement. Technically, legislative authority for NSHCIC ends in May, 1981 when the Heating and Cooling Demonstration Act expires.
Solar Energy Research Information Data Bank (SEIDB) **Public Law** **93-473** **1974**	The SEIDB is operated by the Solar Energy Institute (SERI) in Golden, Colorado. Initially, the SEIDB was designed to supply technical data on solar energy, with users accessing the system through remote computer terminals. However, the SEIDB has recently expanded to an information service paralleling NSHCIC. Two toll-free hotlines have been established at SERI, as adjuncts to the data bank. One supplies information on alcohol fuels; the other answers consumer questions on all solar technologies other than active and passive heating and cooling.
Energy Extension Service (EES) **Public Law** **96-39** **1977**	Established with an explicit mandate not to duplicate other information programs, the EES provides services to individuals and small establishments, in order to encourage conservation and conversion to renewables.
Residential Conservation Service (RCS) **Public Law** **95-619** **1978**	The RCS will operate through gas and electric utilities to provide three principal services: home energy audits; information about contractors who will install energy conserving improvements or solar systems; and arranging for financing of energy conservation measures. The recently passed Energy Security Act will expand the scope of the RCS to small commercial establishments.

Appropriate Management of State and Local Programs

Partnership

The role of the Federal government in bringing about immediate energy conservation improvements is unlike any other function that DOE has served in the past, because of the highly decentralized energy conservation process and the interdependence of Federal, state, and local governments. DOE should assess the strengths and weaknesses of each level, and should not attempt to perform activities that are more appropriate to state or local governments.

Federal policy to encourage the adoption of conservation and solar requires a set of incentives and efforts much different from those used to support other energy technologies. Because of the distinguishing characteristics of conservation and solar that were discussed earlier, particularly the decentralized nature of their use and application, state and local governments must play a large role in partnership with the Federal government in implementing these programs. Two major reasons stand out for strong state and local involvement.

First, the diversity of local opportunities for achieving conservation and solar necessitates a similar diversity of local strategies for taking advantage of these opportunities. No single national strategy can fit the needs and opportunities of all, or even most, communities. Energy consumption patterns, sources of energy waste, climate factors, available resources and capabilities, and building types all vary greatly among communities. Given this diversity, finding the most cost-effective areas for conservation and structuring effective approaches to them is a task best accomplished at the state and local levels.

Second, a major factor in motivating people to invest in conservation and solar is outreach that concentrates on one-on-one contact between energy consumers and energy professionals. The human resources for such outreach activities will have to come from and be organized at the local level. Local governments, by virtue of their connections with local businesses, unions, academia and citizens groups, are in the best position to persuade these groups to join in conservation efforts. Successful conservation efforts so far point convincingly to the importance of local governments in mobilizing and coordinating community resources toward conservation goals.

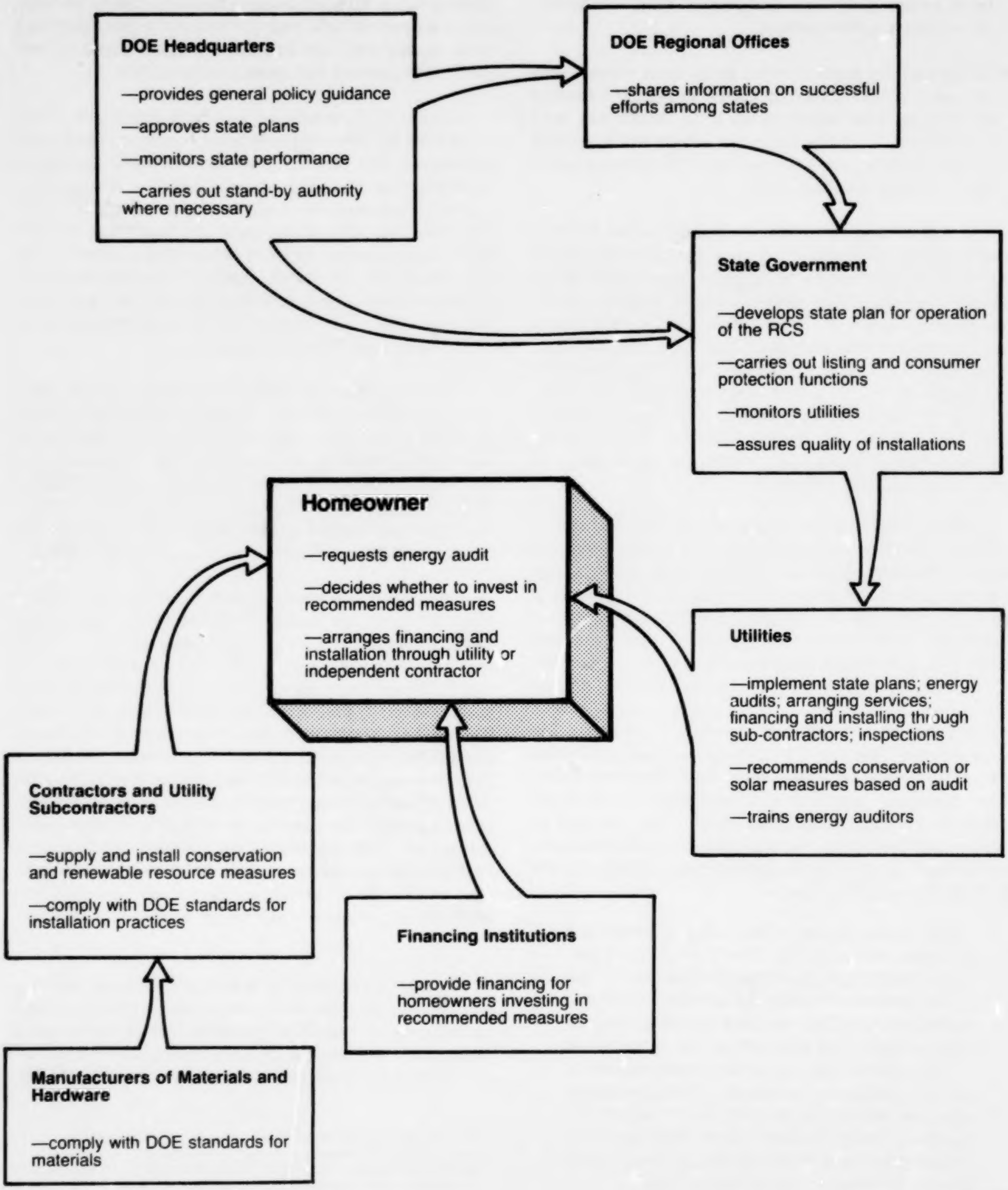
To achieve these goals as rapidly as possible, the President and Congress have identified energy conservation as a priority issue and have enacted a series of programs over the past five years designed to involve state and local agencies in bringing about immediate improvements in the efficient use of energy across the country. The two largest of these programs are the Institutional Buildings Grants Program, intended to upgrade the energy efficiency of schools, hospitals and other public buildings, and the Weatherization Assistance Program, which targets the residences of low-income families for weatherization. Other programs include the State Energy Conservation Program, to build the capacity for energy conservation management in state energy offices, the Energy Extension Service, to provide education, information and direct personalized assistance to individual energy users, and the Residential Conservation Service, to provide information and assistance on weatherization to all United States homes by 1985. With the exception of the Weatherization Program, all of these programs were designed to be implemented through the state energy offices.

While the debate surrounding the unsuccessful efforts to pass the Energy Management Partnership Act underscored the interdependency of all three levels of government upon one another, the basic issue of what role each level of government should play in this partnership has not been satisfactorily resolved. **There is a pressing need for DOE to carefully assess the strengths and weaknesses of each level of government and then to allow a full measure of responsibility for each level based upon its capacities to contribute to energy conservation.** To illustrate the need for clear role definition, Figure 3 shows the large number of actors involved in weatherizing a home under the Residential Conservation Service. This figure demonstrates the potential for confusion about roles that could produce inefficient use of resources, time delays, and frustration for all involved.

To avoid these problems and to best take advantage of the strengths of each agency will require a unique degree of cooperation among all levels of government and clearly delineated roles and responsibilities. EPA's discussions during the 1980 Section 11 review with people involved in these programs from Federal, state and local agencies indicated that there was some consensus on the activities each level was best equipped to perform. For example:

- The **Federal government should establish national program goals** and set guidelines and milestones to achieve those goals. It should provide a sense of mission for conservation programs and the rationale behind goals, so that states and communities have a sense of how a particular program helps the country move forward. **Other functions which DOE is best equipped to fulfill include continuing to provide state-of-the-art information about energy conservation technology and management techniques, technical assistance and training for state and local staffs, and to fund for state and local governments to plan for and implement conservation measures.**

Figure 3.
RESIDENTIAL AUDIT PROCESS


DOE Headquarters
—provides general policy guidance
—approves state plans
—monitors state performance
—carries out stand-by authority where necessary
DOE Regional Offices
—shares information on successful efforts among states
State Government
—develops state plan for operation of the RCS
—carries out listing and consumer protection functions
—monitors utilities
—assures quality of installations
Homeowner
—requests energy audit
—decides whether to invest in recommended measures
—arranges financing and installation through utility or independent contractor
Utilities
—implement state plans; energy audits; arranging services; financing and installing through sub-contractors; inspections
—recommends conservation or solar measures based on audit
—trains energy auditors
Contractors and Utility Subcontractors
—supply and install conservation and renewable resource measures
—comply with DOE standards for installation practices
Financing Institutions
—provide financing for homeowners investing in recommended measures
Manufacturers of Materials and Hardware
—comply with DOE standards for materials

- **The states,** as the bridge between DOE and local communities, are best situated to **coordinate energy activities statewide, develop emergency planning programs and energy-efficient transportation policies, set an example by making energy conservation improvements throughout the operation of their own facilities and programs, and provide technical assistance to local governments.**

- **Cities and counties** have the most direct contact with individual energy users and **should design community strategies that draw upon local resources and capabilities.** They can initate local efforts which respond to local conditions and build local constituencies to support and help carry out these efforts.

In order to strengthen its ability to manage the state and local programs, DOE recently made a number of changes in the Office of State and Local Programs. The position of the director was upgraded to the level of Deputy Assistant Secretary, placing him on a par with the Deputy Assistant Secretary for Conservation. DOE also established a new office of Grants Management and Technical Assistance to consolidate state grant applications and provide coordinated technical assistance where there is overlap among programs. In addition, DOE has recently taken steps to consolidate and simplify administrative procedures for several programs that now have overlapping requirements.

While these changes clearly mark a significant step in the right direction, it is crucial that the remaining legislative and administrative barriers to forging a strong partnership between Federal and state levels be removed. For example, in the past, highly specific program regulations which permitted little flexibility to adapt to state and local energy situations have created problems. Participants in the Section 11 workshops cited the Weatherization Assistance Program and the Residential Conservation Service as programs which were saddled with far too detailed and prescriptive regulations. But to be effective, new programs must be designed to fit within existing conservation efforts, codes and other local restrictions, contractor capability and availability, and other elements of the community environment. Thus, the specific priorities and activities of each program should be developed by the local communities and state energy officials. As one Section 11 participant urged:

> "DOE should provide overall policy guidance and technical assistance but allow state and local programs flexibility as determined by local need... The implementation of policy by detailed regulation, meticulous specification, and inflexible program requirements puts more efforts into organization and paperwork than into actual implementation of energy conservation measures... Federal and state agencies should be oriented toward facilitating (program implementation) rather than rigorously dictating and controlling local efforts." (Paul Tutino, Energy Coordinator, City of Oakland, CA)

One factor that complicates definition of roles and building a DOE-state-local partnership is the varying levels of capability of state and local energy offices. DOE's lack of experience with supporting energy conservation is mirrored in many state and local agencies. There are still many communities that have no energy management capability, whereas others are equipped with staff but no plans, and only a few have trained staffs implementing multi-year plans. As a result, an important role for DOE is to assist state and local agencies to increase their skills and capabilities.

Major components of building state and local capabilities are providing information, technical assistance, and training. DOE should focus more attention on identifying successful projects and invest greater effort in sharing them with other communities. Section 11 participants said that DOE does not successfully market its successes; disaster stories win circulation far more rapidly than notable accomplishments. Yet the constituencies of the state and local programs — state and local energy officials — are hungry for information and case studies that will help them improve their fledgling conservation programs.

The Weatherization Assistance Program, which relies heavily on CETA labor for weatherization crews, is an example of the type of program in which training assistance is particularly important. As weatherization techniques and materials improve, DOE has a role to play in upgrading the skills and capabilities of local crews through training assistance. Such assistance from the Federal level can best provide for transferring state-of-the-art techniques between states.

The President's Clearinghouse for Community Energy Efficiency offers an example of an effective program that combines information-sharing and training. Each month since the Clearinghouse's creation in 1979, a group of local energy officials has spent four weeks at DOE assisting other energy managers from across the country who call in on the telephone hotline for help. These visiting local officials are fully briefed during their stay in Washington by the various program managers within DOE and also meet with conservation staff from other agencies such as HUD. Local officials who have completed this program report having a much better grasp of how DOE operates and seem to have greater success after their Clearinghouse experience in dealing with DOE than before. The Clearinghouse should be continued and expanded to include a wider range of state and local officials.*

A final opportunity for building up a more effective partnership among the three levels of government is **to build up the role of the DOE Regional Offices** in the grant programs. This would not involve adding a layer of bureaucracy to program management. In general, the Regional Offices currently provide assistance to state energy offices and monitor the progress of the grant applications through the administrative process. However, if equipped with appropriate expertise, the Regional Office staff could take an aggressive role in building information networks among states, provide marketing expertise and facilitating training programs.

---

*Although the Clearinghouse provides a useful experience for local officials, the users — people who telephone with problems or questions — are not altogether satisfied with the quality of service provided, perhaps because the local officials are always on the steeply ascending portion of the learning curve.

While DOE has made progress in many of these areas, much more work needs to be done to assure that implementation of the conservation programs is built upon a true, working partnership. The recent changes of the State and Local Program Office are promising but will require continued effort to assure that administrative problems do not hold back its forward progress.

Need for Comprehensive Review

The impending sunset review* of DOE creates a useful opportunity to conduct a comprehensive review of the state and local programs. The review should exmaine the relative resource allocation among programs, and how the grant programs fit into national energy conservation priorities.

The state grant programs discussed in this section were developed independently in response to crises and to meet the needs of specific constituencies. These programs have made a major contribution to furthering energy conservation in the country, but they do not represent a coherent, carefully-planned policy. The Department of Energy Organization Act Sunset Provisions require DOE to submit a comprehensive program review to Congress by January 15, 1982. The review offers a good opportunity to assess the cumulative impact of all of DOE's conservation delivery programs and to match program accomplishments with national energy conservation objectives.

Although the Sunset Provisions call for a program-by-program review, the most important question is, given the resources available and national conservation objectives, what is the most effective way of connecting the two? The **review should examine the programs not only on a case-by-case basis, but more importantly, must assess the overall progess which the programs are making toward national objectives.**

There are a number of additional questions that should be asked in the course of the Sunset Review, foremost of which is the issue of the dual objectives contained in the Congressionally-mandated conservation grant programs. Some of these programs, such as the Weatherization Assistance Program, incorporate both energy conservation and social welfare goals. A decision should be made during the review process about whether there is a sensible balancing of conservation and equity objectives.

The review process should include an assessment of the feasibility of the DOE program goals. DOE should set out reasonable expectations based upon an assessment of the rate of progress at which the state and local governments are proceeding. In certain cases DOE might conclude that achievement of program goals on current timetables is impractical because of the lack of existing institutional infrastructure and might then recommend to Congress a revision of the plans to extend deadlines or revise the program.

The need for this comprehensive review is underscored by an observation from the General Accounting Office's Report, **Energy Conservation: An Expanding Program Needing More Direction** (July, 1980):

> "The Department has yet to develop a comprehensive plan which details how the nation can be moved to greater energy efficiency... What is missing is an explanation of how separate DOE programs will reinforce or complement each other, and what overall contribution is expected to be made by the combination of all programs and activities."

Program Specific Issues

The state and local assistance programs have been hampered by a combination of legislative requirements and administrative problems. These impediments should be removed as quickly as possible.

DOE's state and local assistance programs have the potential for substantial contributions to national energy conservation and attendant reductions in our dependence on foreign oil supplies. These programs are aimed primarily at increasing the energy efficiency of buildings, particularly existing residential and commercial buildings, where the substantial potential for energy savings has been widely documented. **

EPA examined three of DOE's state and local assistance programs — the Weatherization Assistance Program (WAP), the Institutional Buildings Conservation Program (ICP), and the Residential Conservation Service (RCS) — as part of its assessment of DOE's adequacy of attention to conservation. These particular programs were chosen because they account for a significant percentage of DOE's conservation budget.

---

*The Sunset Provisions (Title X of the DOE Organization Act of 1977, Public Law 95-91) require a thorough review of all DOE programs, to be submitted to Congress in January, 1982. Requirements of this review are discussed more thoroughly in the section on Program Evaluation.

**A recent OTA study noted that building retrofit in the residential sector could save the equivalent of 1.9 million barrels of oil per day. Office of Technology Assessment, *Conservation and Solar Energy Programs of the Department of Energy: A Critique*, June 1980, GPO Stock No. 052-003-00757-6.

During the course of the 1980 review, DOE has made changes in these programs, some of which appear to represent significant improvements. EPA has attempted to reflect these changes and the most current information available in this Report.

A major problem with assessing DOE's state and local assistance programs has been the lack of objective data with which to judge the programs' success. Each of the programs examined by EPA has significant problems, but in many cases, it is not possible at present to know precisely the extent to which these problems impede attainment of program goals. DOE is in the process of conducting evaluative studies of WAP, has initiated similar efforts of ICP, and is incorporating ongoing evaluation activities into the RCS. Since the results of these efforts were not available during the course of the 1980 Review, though, EPA relied more heavily on the conclusions developed in its workshops to assess DOE's programs.*

In the process of examining issues surrounding these programs, EPA often found very different points of view which could not be satisfactorily reconciled given the lack of objective data. For instance, the issue of per house spending limits in WAP was seen differently by DOE staff and the state and local program managers attending the workshops. While the workshop participants argued for thorough weatherizations and the need for more flexibility in the per house spending limits to allow such thoroughness, DOE staff emphasized the need to reach as many homes as possible, and pointed out the tradeoff between higher per house spending and number of households which can be assisted in a given year. Better data on energy savings achieved by WAP may point to a better balance between these two strategies, but at present firm conclusions cannot be drawn.

The program-specific discussions which follow attempt to strike a balance between differing points of view where issues are difficult to resolve. For each program, we describe past weaknesses and problems, relate current DOE efforts to improve the programs, and briefly outline areas of continuing concern along with recommendations where appropriate. Figure 4 provides basic information for each of the programs discussed.

Program Specific Issues—Weatherization Assistance Program

The Weatherization Assistance Program (WAP) is DOE's largest conservation grant program, providing subsidies for the weatherization of low-income households, particularly those of the elderly and handicapped. First established as a Federal program in 1974 within the Community Services Administration and subsequently transferred to DOE, WAP aims at increasing energy efficiency among those households which are least able to afford the costs of weatherization. DOE makes grants to the states, which then distribute funds to local governments and local action agencies to perform the weatherization activities. Historically, the program has relied heavily on Comprehensive Employment Training Act (CETA) labor for weatherization crews because of statutory requirements limiting expenditures for labor costs. Recent statutory and regulatory changes have made possible increased use of contracted private labor.

WAP, in the past, has experienced difficulties which resulted in low productivity and expenditure levels. A majority of states were not meeting their goals, due to a combination of management problems, inflexible regulations, and the unavailability of CETA labor. Prompted by criticism that it was not demonstrating an adequate commitment to the program, DOE took several steps to improve the program, beginning in September, 1979, with the development of an Interagency Action Plan that coordinated DOE, Department of Labor and CSA efforts to make sufficient CETA labor available for weatherizations.

In January, 1980, DOE established a Special Project Office (SPO) for WAP, reporting directly to DOE's Undersecretary. The SPO undertook activities to remedy the program's weaknesses, including revising the program regulations in several critical areas, initiating a new reporting system and strengthening program management. In April, 1980, a new program director was named and WAP was returned to CSE.

DOE's efforts over the last year have resulted in substantially increased productivity and expenditure levels. In fiscal year 1979, 94,000 homes were weatherized with expenditures of $40 million, while in FY 80, 265,000 homes were weatherized and $182 million spent. DOE has made significant progress in correcting WAPs past problems; however, there remain areas of concern that require attention.

Program Continuity. WAP's goal of alleviating fuel costs for the nation's poor necessitates as rapid progress as possible toward weatherizing all low-income houses. As of September, 1980, though, the program had reached only 450,000 of the 12.6 million estimated eligible households. As an increasing number of states expand and improve their programs, fears were expressed in the workshops that some states will exhaust their 1981 grants well before the end of that fiscal year, and that the lapse will damage their programs. Continuity is important in order that states and local operators have adequate incentive to maintain effective programs.

Program Flexibility. The wide variation in local weatherization needs, conditions, and resources makes it essential to allow states and local program operators wide latitude in

---

*EPA held two workshops during this year's Review which focused entirely on the state and local assistance programs. The workshops represent one of the first coordinated efforts to bring together state and local program managers from 30 states to discuss their strengths and weaknesses.

Figure 4.
DOE ADMINISTERED STATE AND LOCAL ASSISTANCE PROGRAMS

	Weatherization Assistance Program	Residential Conservation Service	Institution Buildings Conservation Program
Goal	To weatherize low-income homes (no specific goals)	To reduce energy consumption in existing U.S. houses by providing information and other services to homeowners	To offer preliminary audits to 90% of qualified buildings and to fund actual weatherization in some of them, over 3-year period.
Progress to date	450,000 homes completed as of September, 1980	Utilities to begin offering program, Spring 1981.	First grant cycle complete, second underway
Enabling Law	Energy Conservation and Production Act (ECPA), 1976	National Energy Conservation Policy Act (NECPA), 1977.	National Energy Conservation Policy Act (NECPA), 1977.
FY 1981 Funding Level	$182 million	$5 million	$181 million (a matching grant program)
Number of existing buildings in this category	12.6 million	80 million	500,000
Approximate energy use	Unavailable	12.4 quads/year*	2.8 quads**
Implemented by	State offices of economic opportunity, local governments, local community action agencies and other non-profits	Electric and gas utilities, coordinated by state energy offices	Schools, hospitals, public care buildings, local governments
Principal services offered	Funding for staff and materials to carryout weatherization (insulating attics, caulking, etc.)	Energy audits, financing and installation of conservation retrofit measures.	Building audits and implementation of conservation measures.

*1977 residential consumption for space heating, cooling, and hot water. Source: Energy Information Administration

**Source: FY 80 Program Summary Document for Conservation, DOE structuring their weatherization programs. DOE regulations for WAP remain too prescriptive in some provisions, and do not take the need for local flexibility into account.

For instance, the present limit on per-house expenditures ($1,000; $1,600 if contracted labor is used) is regarded by many state and local managers as inadequate for completely weatherizing many houses. They emphasize the importance of thorough weatherizations, particularly given the significant fixed costs of weatherizing a house that are incurred regardless of the completeness of the job. Higher per-house expenditure limits would substantially benefit many houseowners receiving weatherizations, as would some flexibility for the limit, such that local operators could vary per-house spending so long as the average for a group of houses remained within the limit. However, this would introduce a tradeoff between thoroughness of weatherizations and number of households reached, since increasing the per house expenditures would reduce the number of homes WAP can reach. As more data on the program's performance becomes available, the per house limit should be reevaluated in light of the concerns expressed by state and local managers.

Substantive Issues. In addition to these administrative problems, workshop participants identified two substantive issues related to the long-term effectiveness of WAP: rental housing and need for coordination between WAP and the Low Income Energy Assistance Program (LIEAP).

Over 50 percent of low-income households rent their dwellings, yet WAP has had only limited success in reaching the rental sector. The original legislation creating WAP contains a provision requiring that landlords of rental units guarantee that the major portion of weatherization benefits will accrue to the occupants. Many observers feel this has discouraged landlords from signing the required agreement which would permit their low-income tenants to participate in WAP. Most participants in the Minneapolis and Portland workshops agreed that WAP should not be relied exclusively on to reach the low-income rental sector; they suggested that other incentives, such as an increased tax credit for landlord investments in conservation, might be more effective.

It would be useful for WAP to better coordinate with LIEAP, which provides fuel subsidies to low-income households. LIEAP payments, though vitally important to many poor households, do nothing to increase energy efficiency and represent an indefinite drain on the nation's resources. LIEAP assistance could be reduced by more closely coordinating the weatherization program with LIEAP so that households receiving energy assistance would be targeted for priority weatherization. In Missouri, for instance, low-income households must apply for weatherization in order to qualify for LIEAP assistance. DOE should examine this approach and other ways of coordinating weatherization with LIEAP.

Program Specific Issues — Residential Conservation Service

In recognition of both the substantial energy savings possible in the residential sector and the unique capacity of utilities to help bring about these savings, Congress adopted the RCS to expedite residential weatherization in the United States. The RCS requires utilities to offer energy audits to all residential and small commercial customers, accompanied by follow-up assistance in implementing the recommendations arising from the audit. States carry the primary responsibility for program management.

Support for the RCS goals is widespread, as the two Section 11 workshops with state and local government energy managers revealed. There are even a few cases where states initiated their own energy audit programs prior to the RCS, and also where utilities initiated conservation programs of their own. A broad consensus was expressed in the Section 11 workshops that enlarging the utilities' energy delivery capacity to include the delivery of conservation is appropriate in reducing the country's energy use.

However, there is also widespread doubt about the feasibility of the program and the ability of the program to accomplish its goals. Section 11 participants predicted that without increased staffing for all levels of the RCS — DOE, the states and utilities — the program will not succeed. In many cases, states and utilities do not have the capability to implement and manage the program. The states are charged with substantial responsibility for implementation of RCS. Among the activities for which the states are responsible are the investigation and enforcement of utilities' compliance; development of consumer complaint procedures; listing of all suppliers, lenders and installers willing to participate in the RCS, record-keeping of utilities' progress, as well as reporting requirements to DOE. Participants at the Minneapolis and Portland workshops expressed strong doubts about the feasibility of the RCS without direct financial aid to enable the states to carry out RCS duties. It was suggested that Congress may not be aware of the considerable effort required of the states and non-regulated utilities to implement the RCS.

Program Flexibility. Participants generally agreed that the RCS is being implemented under a highly detailed and prescriptive set of regulations, many of which were necessitated by the similarly detailed language of the authorizing legislation. As a result, the states have only limited flexibility in designing the plans which will guide implementation of the RCS. The regulations, by requiring certain services and prohibiting others, substantially restrict the range of strategies the states and utilities can employ to accomplish the goals of the program. For instance, the regulations prohibit utilities from giving away free conservation measures during home energy audits, even though this service might sometimes benefit both utility and customer as well as provide an effective encouragement for further conservation investments by the homeowners.

On the other hand, DOE believes that it has exercised great care to provide states with ample flexibility in designing their RCS plans, and that states' or utilities' difficulties with the RCS arise from their reluctance to take steps that DOE feels are necessary to an effective program.

Utility Credibility. For homeowners to request and pay for energy audits, the utilities must be seen as a credible source of information on home energy conservation. Several provisions of the present regulations, however, work against utility credibility. For instance, workshop participants felt that the required state-approved lists of contractors and financial institutions will not work as intended by Congress, and may damage the credibility of utilities distributing them by containing inaccurate or misleading information. They recommended that the requirement for listing be dropped from the regulations, and suggested that more useful information could be provided through consumer guidance booklets covering conservation financing and contracting. Other important aspects of RCS credibility that DOE should ensure: program announcement requirements that allow utilities to mail their announcements over a broad enough period of time to avoid building up a backlog of audit requests that they cannot promptly satisfy, and assistance to states and utilities in building staffs of well-trained, effective energy auditors, skilled at working with homeowners on conservation techniques as well as assessing the best strategies for each home.[*]

Program Specific Issues — Institutional Buildings Conservation Program

The second largest conservation grant program at DOE, the ICP is targeted at upgrading the energy efficiency of the country's schools, hospitals, local government and public care buildings. As the most ambitious conservation program directed at non-government public buildings, the ICP has pioneered in the development of a public energy management infrastructure and in educating state and local officials, many of whom would otherwise have postponed taking conservation actions without Federal leadership and support.

However, the problems encountered in the implementation of the ICP illustrate the serious consequences of an ambitious timetable, coupled with delays in authorizing the program[**] and lags in revising the original timetable to reflect those delays. When the program was initiated, there was little opportunity for adequate planning and development, inclusion of participants in the planning process, and the resolution of key policy issues. Outside Washington, the impact of the deficiencies was keenly felt. Had the necessary energy management infrastructure already been in place at the state and local levels, it might have been possible for some states to conduct feasibility studies, design programs, and submit applications without serious delay. However, because the ICP was a ground-breaking effort, they generally lacked the necessary skills to plan for and implement the program. The ICP goals as a result proved unattainable and many participating states, institutions and local governments found the ICP to be an attractive but frustrating program. The problems associated with the ICP cogently illustrate the consequences of forcing a program to implementation before DOE, State, and local agencies have developed the capacity to manage that program.

Program Pacing. During its first years, the ICP experienced a series of problems related to program pacing and the constraints of the Congressional timetable. Because of late passage of the FY 80 Appropriations Bill, timetable changes and late announcements of funding availability, the states and local institutions had insufficient time in many instances to adequately prepare grant applications, plan local matching funds, and perform other tasks. Participants at the Minneapolis and Portland workshops felt that many localities and institutions were discouraged from participating in ICP at least partly by DOE's unrealistic time requirements. DOE's requirements however, resulted from the short time-frame provided for ICP in the authorizing legislation, and the lateness of the Appropriations Bill. The workshop participants urged that Congress be made fully aware of the pacing problems it created in the ICP.

DOE is now moving to full year grant cycles for ICP, which should ease the time constraints on states and local institutions. It is important that participating institutions have at least 90 days from the time of receiving the grant application forms to the due date for their submission, in order that they have adequate time to prepare the applications. States also need sufficient time to prepare their grant management plans, to notify and assist the local institutions, and to involve them in the planning process.

Program Continuity. The original ICP authorizing legislation provided for funding through FY-80, with the intention that three years would be sufficient to achieve the program's objectives. In view of the problems experienced during the first two grant cycles and the time required to make the program operate smoothly, some revision of the original expectations for the ICP are needed. The consensus of the workshop participants involved with the ICP was that the program has only recently overcome many of the problems that had constrained it. With most of the "starting-up" problems resolved, these participants felt that the ICP can be expected to accomplish significant results if continued for a few more years.

Program continuity is also critical to the local institutions participating in ICP. Since participating institutions have to come up with matching funds for the ICP grants, they need to plan for the grants well in advance of their availability. Schools, hospitals and local governments typically have to identify matching funds for ICP grants during the budget process that precedes each fiscal year, which means that ICP grants should be announced at least a year ahead of the grant cycle. To allow local institutions to plan ahead for participation in ICP, DOE should announce the grant cycles a year ahead, removing much of the uncertainty that currently hampers participation in the program.

---

[*] In this case, ICP was contained in the larger, complicated National Energy Conservation Policy Act (Public Law 95-619)

[**] Support for auditor training was included in the Energy Security Act

Undue Expense for Small Grant Applicants. It appears that the complexity and expense of applying for ICP grants have discouraged some institutions seeking small grants from participating in the program. The same application forms and reporting procedures are used for institutions seeking $500,000 or $500 grants, even though the administrative cost for institutions applying for and reporting on small grants can exceed the amount of the grant. DOE could act to ease the paperwork burdens on states and local institutions in several ways: by providing simpler grant applications forms, reduced reporting requirements and simpler audit procedures for small grant applicants.

Energy Conservation Measure Funds for Local Government. As currently authorized, ICP provides funds to units of local government and public care centers for energy audits and technical assistance, but not for actually implementing or installing the chosen conservation measures. Schools and hospitals, on the other hand, receive funds for all three phases. Although local governments can obtain funds for conservation retrofits through other Federal sources such as the Economic Development Administration, unavailability of ICP funds for conservation measures may have discouraged local government participation in the program, since many governments have apparently been reluctant to apply only for energy audit and technical assistance funds.

DOE should promote an awareness among local governments of the benefits of the ICP energy audit process. Given the enormity of the retrofit task facing local governments, much if not most of the needed funds will have to come from local sources. ICP energy audit assistance, while not funding retrofits, can be valuable to local governments interested in establishing a systematic, ordered approach to conservation. DOE needs to "sell" the energy audit process aggressively as part of its activity to stimulate local initiative in conservation.

Appropriate Management of Research and Development

Innovation

Considering the importance of innovation in conservation and solar programs, DOE appears to be giving it a low priority. Programs managed by the Office of Inventions and Small Scale Technology should be given increased emphasis and have closer ties with the conservation and solar programs.

The Section 11 review defined innovation broadly to include the creation, design, production, first use and diffusion of a new technological product, process, or system.* The innovation process is not limited to technological breakthroughs in the research phase. Innovation can also occur in systems for adoption of the technology, such as production, marketing, information dissemination, training, and other activities.

In the last few years there has been increased interest in innovation, spurred in large measure by an apparent decline in industrial productivity. The interest in innovation is apparent in both the Executive Branch and in Congress. For example, President Carter initiated a Domestic Policy Review of Industrial Innovation, under the aegis of the Department of Commerce, which was completed in October, 1979. Congressional attention to innovation is reflected in the Stevenson-Wydler Technology Innovation Act of 1980 which would create joint industry-university centers to develop the R&D base for selected technologies. Other legislation relating to patent reform, small business exports and trade policy is currently pending before both Houses.

Energy is a key factor in industrial production, especially as energy prices have increased dramatically in recent years. A recent report by the National Academy of Sciences Committee on Nuclear and Alternative Energy Sources concluded that increases in efficiency may be prerequisite for continued growth in the gross national product. Substantial improvements in energy efficiency depend on a number of factors including energy prices, information systems and the growth of a conservation infrastructure. However, such improvements will also be influenced by a willingness to innovate in the private sector combined with government policies that foster innovation.

The character of the innovation process is one factor that differentiates conservation and solar R&D from R&D programs related to centralized energy sources. In the latter, attention is concentrated on developing a few alternatives to one basic concept such as gas-cooled reactors replacing water-cooled reactors or a thorium-based fuel cycle as an alternative to the uranium fuel cycle. By contrast, innovation in the conservation and solar area involves the development of a wide range of new products, processes and technologies. It encompasses the application of these ideas in each of the end-use sectors for different regions. Innovations can also involve the combination of technologies in different ways: solar systems with heat pumps, wood stoves with solar, wind or photovoltaics for powering electric cars, and so on.

**SERI Solar Conservation Project: Task Force on Innovation,* June, 1980, draft.

Most of the research and development for centralized technologies can be conducted by a relatively small number of large firms and national laboratories. By its very nature, solar and conservation R&D requires a considerable amount of "prospecting" for new ideas and approaches in many areas. Many of these will be either technically unsound or commercially unsuccessful. But a small number of successful innovations — perhaps one or two percent of all tried — could dramatically transform energy use patterns.

The Section 11 analysis focused on two aspects of DOE efforts to promote innovation in conservation and solar activities.

- First, the Section 11 program examined management practices that affect the overall "climate of innovation" at DOE. These include procurement policy, management of field activities and relationships with state and local governments. Recommendations which would lead to improvements in these areas and a more favorable "climate of innovation" are discussed in other sections of this Report.

- Second, EPA has reviewed the programs specifically designed to promote conservation and solar innovation, and the results of this review are presented in this section.

Inventions and innovation in conservation and solar research and development occurs within DOE's program offices and within several other specialized offices. There are two programs managed by CSE's Office of Small Scale Technology — the Appropriate Technology Small Grants Program and the Energy Related Inventions Program — and one within the Office of Energy Research — the Advanced Technology Projects Office (ATPO). (ATPO manages a small number of projects in all areas of energy, not just conservation and solar.)

The Office of Inventions and Small Scale Technology (OISST) was originally proposed in the National Energy Plan to "fund small, innovative research and development projects." The Appropriate Technology (AT) Grants Program was mandated by the ERDA Authorization Act of 1977. It was designed to reach individuals and institutions that did not have the resources to get a favorable response from DOE's regular procurement system. Grants were limited to no more than $50,000, and DOE was instructed to develop a simple solicitation that could make awards in a short period of time. The program began as a pilot in FY-78 and the first coordinated national solicitation was issued in February, 1980. Program funding has increased from $8 million in FY-79 to $12 million both in FY-80 and in FY-81.

The Energy-Related Inventions (EI) Program is conducted by DOE with the assistance of the National Bureau of Standards. Its purpose is to assist independent inventors and small businesses in developing and commercializing inventions which show significant promise for energy conservation or providing new sources of energy. The assistance usually provided is a one-time direct grant to the inventor — typically $50,000-$80,000 — but may take other forms, such as invention testing services at government labs, market analysis studies performed for the inventor, and occasionally access to contracts elsewhere in DOE. As of December, 1979, 61 inventors had been assisted through the program; total awards were slightly more than $4 million.

Although neither the AT nor EI programs have been in operation for more than three years, they are serving as a source of new ideas, and they provide access to Federal funds for individuals and organizations who have traditionally been excluded from the complex, time-consuming procurement system. During the FY-79, $340 million worth of grant applications were received for $8 million in available funds. About 18% of these proposals were rated good to exellent by technical reviewers. State "peer review" committees concluded that 36% of all proposals were worthy of being funded.

The effectiveness of both programs could be improved through:

- Better integration with other CSE programs; and

- Modifications to the programs themselves.

One problem with the AT and EI programs is their separation from other R&D efforts. **DOE should develop systematic mechanisms for bringing the results of either program to the attention of the DOE program managers, and for channeling unsolicited proposals received by other program offices to OISST.** One factor that may affect communication and coordination is the fact that OISST reports to the Deputy Assistant Secretary for State and Local Programs rather than the solar or conservation R&D branch. Because the AT grant money is administered regionally and apportioned to the states, there is some justification for this organizational arrangement. However, more than two-thirds of the FY-79 AT grant funds were awarded for renewable energy projects, and clearly there is a need to coordinate closely with the solar office. (Although it is sensible to collocate the AT grants and EI programs, the states and regions have no substantial involvement in the EI program.)

Further, there has been no coordination between OISST and the Advanced Technology Projects Office. ATPO is responsible for intensive management of a small number of selected high-technology research projects, and OISST is responsible for funding a relatively large number of low-technology projects. However, both offices are concerned with the adoption of innovative projects in the marketplace. They should be aware of each other's programs and strategies.

Secondly, there are a number of program-specific improvements that could be made in the AT program. The existing AT solicitation could be modified to allow a more intensive focus on a particular technology or approach. Currently, applicants can submit a proposal on any topic that fits the broad criteria in the program announcement, which state that the projects should be oriented toward local needs, be labor intensive, environmentally benign and utilize local resources. **DOE should consider establishing specialized solicitations.** These solicitations should be developed in cooperation with the relevant conservation or solar program office to emphasize solutions to particular problems. The specialized solicitation should be developed after a series of outreach activities to tap the opinions of relevant constituencies on priorities. These solicitations would supplement the current program announcement, not substitute for it.

The **AT program could also benefit substantially from the experience of other innovation-related activities conducted by the Federal government.** Perhaps the most useful model is the Small Business Innovation Research Program (SBIR) administered by the National Science Foundation. The SBIR program is designed to encourage a systematic progression from concept development through marketing. In particular, as a means of ensuring commercial adoption of products of research, SBIR proposals that demonstrate a commitment for follow-up funding from the private sector or other sources, receive extra consideration as a point of merit in the evaluation process. SBIR also gives much larger awards — averaging $200,000 for projects that progress beyond the concept development state. For the AT program to provide similar support and incentives to its grantees, Congressional action would be required to raise the limits on grants. However, no legislative changes would be required if the equivalent of SBIR funding were supplied by the solar or conservation program offices, possibly in combination with the AT Office. This presents an excellent target of opportunity for coordination of the AT program with other offices in CSE.

The AT Program should also incorporate some of the approaches of the Energy Related Inventions Program. The EI Program is able to supply technical assistance as well as support to prospective inventors. The AT Program should also make technical assistance available to grantees.

Some Section 11 participants felt that it may not be possible to foster innovative conservation and solar research within the Department of Energy. For example:

> "The present efforts in DOE represent a new low in innovation as far as I am concerned. The amount of effort that is expended on truly new innovations is now at an all time low. . . The program planning by essentially non-innovative risk-adverse type people simply. . . leads to the situation in which there is no room for innovators." (Dr. Jerry Plunkett, Managing Director, Montana Energy and MHD Research and Development Institute.)

The possibility of transferring innovation related programs to the private sector should be examined.

Procurement and Financial Assistance

DOE is taking some steps to adapt its procurement and assistance relationships to conservation and solar activities. Continued actions are needed to ensure that there are significantly reduced delays in making financial awards.

Many of the conservation and solar programs involve a financial relationship between DOE and the private sector, state and local governments and individuals. Awards are made through a variety of financial instruments, including contracts, grants, cooperative agreements, and loan guarantees. The efficiency and effectiveness of DOE's financial processes can have a significant impact on the adequacy of attention to energy conservation.

In EPA's Section 11 workshops, participants cited procurement as a major problem in both state and local programs and R&D programs. In addition, DOE's procurement policies have been singled out for attention in a General Accounting Office report, an Office of Technology Assessment study, and recent testimony by CSE officials.*

One problem noted by most of these sources is the extensive delays in processing procurement requests. These delays can slow the attainment of program goals, make it difficult for program offices to expend appropriated funds wisely, and cause severe cash flow problems for prospective contractors, particularly small businesses. Other problems that have been mentioned are a lack of receptiveness to unsolicited proposals, excessive costs incurred in both writing proposals and complying with contractual requirements, and too great a reliance on large corporations and National Laboratories.

EPA looked at ways in which DOE's procurement system is in many ways inappropriate for conservation and solar

---

*For example, recent testimony of Dr. Thomas Stelson, DOE Assistant Secretary for Conservation and Solar Energy noted that: "Procurement is another critical area with us. We have more small programs in conservation and solar energy. That is, we have lots of little programs. We are dealing with many unsophisticated contractors and grantees. We, for example, have exceeded our minority business goal, and so on. Now, these small and unsophisticated contractors need a lot of help to relate to the Federal government. If we had more personnel, I think that we could get our procurement process to be very much improved. Currently it takes four to seven months to process the procurement out to them. So, we have lots of operating difficulties like that."

Testimony of Dr. Thomas Stelson, *Oversight Hearings on the Department of Energy Conservation and Solar Energy Programs*, Committee on Science and Technology, Subcommittee on Energy Development and Applications, U.S. House of Representatives, September 9, 1980. Unpublished Committee Transcript.

A recent OTA report draws the following conclusion about the DOE procurement and contracting system: "The substantial delays and bureaucratic complications that characterize the current DOE procurement process threaten the viability of even the best conceived and most competently planned initiations." Office of Technology Assessment, *Conservation and Solar Energy Programs of the Department of Energy: A Critique*, June 1980, p. 23, GPO Stock No. 052-003-00757-6.

R&D. As discussed in an earlier section, when the Department of Energy was established in 1977, most of its administrative procedures were adapted from its principal predecessor, the Energy Research and Development Administration, the successor to the Atomic Energy Commission.

The AEC/ERDA procurement process was modeled after the Major Systems Acquisition approach, also utilized in the Department of Defense and the National Aeronautic and Space Administration.* It was designed to guide the development of large scale equipment or systems for use by the government itself. Under this process, Federal program managers define the steps that must be taken in producing a final product, as well as the criteria that product should meet. The Major Systems Acquisition process assumes that since the government knows precisely what it wants in terms of product performance, it is best able to achieve its goals by defining and monitoring how the product is developed. This may be workable when the government wants to obtain a piece of equipment. However, the Major Systems Acquisition approach is less useful when the Federal agency can neither precisely define the product, nor how it is to be produced. The process may be deficient if the ultimate goal is to foster innovation and the commercialization of new technologies in the marketplace.

An alternative approach, which permits greater flexibility, is the use of assistance relationships, as defined under the Federal Grant and Cooperative Agreement Act of 1977 (Public Law 95-224). These provide a means for sharing information and responsibility with non-Federal participants while retaining for the Federal government the degree of control necessary to achieve policy objectives. In assistance relationships, the Federal program manager does not have to define the precise specifications for the final product. Instead, the manager identifies the overall desired result, and contractors are free to apply their own expertise during contract execution, a task that is simplified by the formal agreement with the government or the definition of what the "product" should be. If the provisions of the Act could be applied, the respective Federal and contractor roles could be defined in terms of encouraging marketplace innovation rather than procurement of products for government use.

DOE's major experience with assistance relationships has been in the state and local programs area. The solar program has also utilized assistance modes from time to time. For example, Texas Instruments and DOE entered into a cooperative agreement to develop TI's residential photovoltaic fuel cell combination. Similarly, the Solarex Corporation received a DOE grant to pursue its process for the production of lower cost silicon photovoltaic cells.

In March, 1979, after the passage of the National Energy Conservation Policy Act (NECPA), DOE promulgated its final rule on Assistance Regulations (Federal Register, Vol. 44, No. 47, March 8, 1979). These regulations provide guidance on the use of grants and cooperative agreements in situations when a financial award is clearly in the assistance mode.

At this point DOE does not have a department-wide policy for defining the circumstances under which program managers can utilize assistance relationships as an alternative to procurement instruments. However, DOE currently has under development a set of guidelines that should help to systematize the process of making financial awards. Utilizing this Program Principal Purpose Determination (PPPD), program managers may be able to more readily distinguish between procurement and assistance relationships. The PPPD will probably have a more substantial impact on CSE than on the rest of DOE. Therefore, Congress needs to closely monitor the implementation of PPPD guidance to determine if it resolves some of these problems.

Field Activities

DOE needs to devise a consistent policy for the use of the multiprogram national laboratories in conservation R&D. There is scope for combining conservation and solar activities and for giving SERI and the RSECs greater flexibility in their day-to-day operations.

DOE inherited a well-developed field structure for R&D composed of a nationwide network of national laboratories. With the addition of fossil, conservation and renewable resource activities to its mission, DOE has modified the field structure with the establishment of the Energy Research Centers for fossil activities, the Solar Energy Research Institute and the Regional Solar Energy Centers. However, there has been no lead center created for energy conservation.

There is disagreement over what an appropriate field structure for conservation would be. National Laboratories have amassed a wealth of scientific and technical talent. However, technical breakthroughs alone are not sufficient for accelerating the use of energy conserving improvements and solar systems. Certain institutional barriers such as zoning restrictions, consumer assurance, building codes, access to capital, and utility interface can hinder adoption of conservation and solar to a far greater extent than they can impede other technologies.

Because of the talent and resources within the National Labs, it is natural to assume that they can play a major role in all new areas. For example, GAO** has recommended that the National Labs play an increased role in nonnuclear energy technologies. The report suggested realignment of the eight multiprogram laboratories under a separate office in DOE to facilitate greater involvement in nonnuclear R&D. (Currently the multiprogram laboratories report to the office in DOE that is responsible for the principal activity of a particular lab.)

---

*The 1979 Section 11 Report (EPA 600/9-80-008, January 1980) discussed the Major Systems Acquisitions Process as it affected environmental assessments in technology development. See pp. 7-8, 17-18.

** General Accounting Office, *The Multiprogram Laboratories: A National Resource for Nonnuclear Research, Development and Demonstration*, May 1978, EMD 78-62.

However, participants in the EPA Section 11 workshops had a very different point of view from GAO. They expressed the belief that DOE's prior commitment to maintaining the National Laboratories stifles innovation by making it difficult for small business, individuals and private sector labs to compete for Federal funds on an equitable basis. It was even suggested that DOE consider phasing the National Labs out of solar and conservation work.

The following steps should enable DOE to take better advantage of the resources in the National Labs, SERI, and the RSEC's.

First, **DOE should develop an explicit policy on the use of the multiprogram laboratories in the conservation effort.** This will not be an easy task since the labs report to different offices within DOE. Only SERI and the RSEC's are under the direct control of the Office of Conservation and Solar Energy. Currently, individual laboratories, as well as SERI and the RSEC's, develop both annual and multiyear plans for all activities, including conservation. However, there does not appear to be an overall DOE plan for distributing conservation activities among various field operations. Decisions appear to be made on an **ad hoc** basis, and each program office decides how much of its work should be contracted to the National Labs. This approach may yield excellent technical results; the energy conservation groups at Oak Ridge and the Lawrence Berkeley Laboratory are clear examples. However, other objectives can easily be lost sight of, including involvement of small business, a proper balance between R&D and commercialization, and encouragement of a regional and local emphasis for conservation activities.

Second, **establishing a field structure to coordinate both conservation and solar should be considered.** The current arrangement is a reflection of the overall lack of integration between conservation and solar in DOE. Careful consideration ought to be given to gradually expanding the role of both SERI and the RSEC's into conservation. Perhaps the most sensible approach would be to make SERI and/or the RSEC's principal contractors for efforts that involve both renewables and energy conservation.

Finally, **in some areas, SERI and the RSEC's should be given more flexibility in the conduct of their day-to-day operations.** For example, SERI's FY-80 operating budget was more than $120 million. Yet only $2 million was available for discretionary activities. Both DOE and SERI are constrained by requirements in authorization and appropriation bills. However, SERI's mission as a lead center for solar R&D might be hindered if it does not have more flexibility to pursue promising technical applications.

Assessment of Program Evaluation

Overview

Considering the importance of choices for both resource allocation and management, does DOE have adequate information for decision making?

Members of Congress, the General Accounting Office, DOE officials, and Section 11 participants have all stated clearly that adequate information for energy policy formulation, resource allocation, program management, and accountability has not been available. Program evaluation[*] could make a substantial contribution to improving the information base by providing data on actual program performance, and DOE should take the steps required to ensure that this evaluative information will be produced. These steps include establishing department-wide policy on the conduct of evaluation, creating incentives to encourage good evaluations, and devoting resources to developing needed research technologies.

Program evaluation is particularly important for conservation programs because their effects are more difficult to document than those of many supply programs, and less is understood about the factors that affect energy use. Although evaluation of these programs is not easy, several high quality studies in the past prove that it can be done. DOE's Office of Conservation and Solar Energy is currently developing a comprehensive plan for evaluating its programs.

Background

Need for Evaluation

> "Fenagle's Law:
> The information we have is not what we want. The information we want is not what we need. And the information we need is not available." (Eric Hirst, Oak Ridge National Laboratory).

Both Congress and DOE have become increasingly concerned about understanding and documenting the results of energy programs. In many cases, however, lack of information on program outcomes and the contribution of programs to specific policies has made it difficult for Congress and DOE to chart a course which is most likely to achieve energy policy goals. For just as it is important not to waste money on programs that are not cost-effective, it is equally important not to terminate a promising program before its effects are known.

It is clear that serious attention is now being focused on evaluative questions regarding energy programs. The need for additional information on program costs, benefits, and performance has been recognized by a number of sources, including the Office of Technology Assessment, the General Accounting Office, the Congress, observers of DOE programs, and DOE itself.

---

[*] Because the term "evaluation" is often used loosely to describe any formal or informal assessment of actual or anticipated results of a program, it is important to provide a working definition. For purposes of this discussion, evaluation is viewed as a formal, systematic study of the actual processes or results of a program. Evaluation is a retrospective or historical activity examining what has occurred or is occurring. It is therefore clearly different from projections, forecasts, and other studies of proposed or hypothetical programs.

Participants in the 1980 Section 11 program argued strongly for the importance of more and better evaluation of DOE's programs. Whether they were discussing policy analysis, information dissemination programs, or state and local assistance programs, the need for evaluation and the information it produces was raised. In discussions focused specifically on evaluation, the message was clear — **DOE must systematically evaluate the performance and effects of its programs, and the results of these evaluations should be used at all levels of the Department to improve decision making.**

Although the 1980 Section 11 program emphasized conservation and solar programs, **participants stressed the need for evaluation to be applied to the entire range of DOE supply enhancement and demand reduction programs.** In fact, one participant summed up the views of many others when he stated:

> "If the CS programs are more critically evaluated than other energy programs, they may be put at a disadvantage. Evaluation historically has tended to be more negative than positive. If conservation and solar programs are thoroughly evaluated and the nuclear, coal, oil shale, etc. programs are not, conservation and solar will be at a disadvantage in competing within a constrained program budget. Proponents of competing energy programs will be less vulnerable to criticism and also better armed to criticize CSE programs." (Lewis Perleman, Jet Propulsion Laboratory.)

Many of the examples in this chapter are drawn from conservation and solar programs, but it must be stressed that evaluation can only contribute to ensuring adequacy of attention to conservation and solar if **all** DOE programs are thoroughly evaluated. Therefore, the recommendations presented in this Chapter are not directed at the Office of Conservation and Solar Energy, but are intended for DOE as a whole.

Current DOE Evaluation Activities

Many DOE officials recognize the need for more information based on program evaluation. Within Conservation and Solar Energy (CSE), several evaluative activities are underway. Many of the program offices are conducting or planning studies of specific programs. CSE reports that evaluations are "in process" for the following programs and projects: Schools and Hospitals, Energy Conversion and Utilization, Appropriate Technology, Weatherization, Comprehensive Community Energy Management, Solar Heating and Cooling, and Solar Applications for Buildings. In addition, there are plans to evaluate the Residential Conservation Service, Appliance Standards, State Energy Conservation Programs, Energy Extension Service, Energy-Related Inventions, and Solar International (SOLERAS). Staff within the Office of the Assistant Secretary for Policy and Evaluation provide informal guidance and assistance in these efforts.

CSE's Office of Policy, Planning, and Evaluation is currently developing an Evaluation Plan for all CSE programs. This effort has included a survey and inventory of current and past evaluation activities, identification of the CSE Assistant Secretary's information needs, development of evaluative criteria, and definition of roles for implementing evaluations. It is too early to comment on these activities; however, CSE is to be commended for taking the initiative to develop this plan in the absence of specific guidance or requirements from higher DOE management. To some extent, the Office of Conservation and Solar Energy represents a microcosm of the overall variation among programs at DOE since CSE includes all of these program types. Thus, insofar as CSE can overcome comparability problems in its Evaluation Plan, it will demonstrate the feasibility of using evaluative information for cross-technology comparisons.

DOE is also beginning to work on its response to the "Sunset Provisions" (Title X) of DOE's Organization Act (Public Law 95-91). This section mandates a comprehensive review of each DOE program to be submitted to Congress no later than January 15, 1982. The review must include:

- An identification of each program's objectives;
- An assessment of the degree to which the original objectives of each program have been achieved in terms of performance, impact, or accomplishments;
- A statement of the number and types of beneficiaries or persons served by each program; and
- An assessment of the effect of each program on the national economy, health and safety.

Preparation of the Report will be the joint responsiblity of DOE's Chief Financial Officer and the Assistant Secretary for Policy and Evaluation.

An in-depth review of all of the areas included in the Sunset Provisions is an enormous and expensive undertaking. It is not clear that DOE's approach to this requirement accurately reflects its importance. **Considering the Sunset Review's potential visibility and the vigorous debates it is likely to engender, DOE does not appear to be devoting the necessary time or effort to it.** Conservation programs in particular may have difficulty documenting their results because of the lack of available evaluative information.

Currently, DOE appears to be emphasizing avoidance of overlap with their Annual Report, and may not be giving adequate attention to requirements for consideration of alternatives to each program and steps that would be necessary to phase out a program. Guidance to the program offices for preparing material for the Sunset report is not scheduled to be available until February. This leaves very little time to assemble necessary documentation.

Much of this section is devoted to examining the problems involved in designing and implementing evaluations. It is important to stress, however, that **these problems are not insurmountable,** and that DOE has conducted high quality evaluations in the past which have contributed to decision making. Section 11 participants cited DOE's evaluation of the Energy Extension Service* as an example of the value and feasibility of evaluating DOE's conservation and solar programs. This study demonstrated that many methodological problems can be overcome and that evaluation can provide useful insights for decision makers. The findings of this study supplied essential information for Congress' deliberation on whether to expand the program nationwide, and guided the development of the Program Planning Manual, which advises states on how to set up their programs.

Uses of Evaluation

Adequate information on the effects of energy programs and the performance of specific DOE projects has not been available to Congress, DOE officials or the public. DOE should systematically evaluate its major programs and incorporate this information into its ongoing management processes.

As those who have experience in designing and conducting evaluations are aware, evaluation can serve a variety of purposes, and no single study can serve them all. These purposes include:

- **Basic Knowledge:** it can contribute to an improved data base for policy formulation.
- **Resource Allocation:** it can enable decision makers to use more precise analytical tools in the resource allocation process to compare the relative cost-effectiveness of various programs.
- **Program Management:** it can assist program managers in improving the efficiency and effectiveness of their programs.
- **Accountability:** it can permit Congress, the public, and the press to scrutinize programs.

Although these areas are not as clear cut and distinct in practice as they are on paper, they highlight the wide variety of areas in which evaluation can be useful. Participants in the Section 11 program felt that it was important to emphasize that evaluation does not only contribute to "go-no-go" decisions. Therefore, each of these potential uses of evaluation are discussed briefly below.

Basic Knowledge. DOE already understands a great deal about how energy is produced, but it needs to understand a great deal more about how energy is used. Currently, policy makers do not have an adequate understanding of issues such as what will actually cause changes in energy consumption — price increases, information and promotion campaigns, tax incentives — and how lasting certain behavioral changes are. Although enhancing basic knowledge is rarely a primary purpose of an evaluation study, **accumulation of a number of evaluations will in fact contribute significantly to DOE's understanding of energy problems and potential solutions.** For example, evaluations of outreach and information programs can provide a better understanding of consumer behavior and how conservation programs interact with the market to affect consumption; evaluations of demonstration programs can lead to more accurate characterization of market forces and barriers to adoption of technologies or products. Knowledge of this type will reduce some of the uncertainty that now surrounds policy making, especially in terms of what level of energy savings can reasonably be expected in the future from various types of Federal activities, and can enable program planners to design programs with greater likelihoods of success.

For evaluation to produce this type of information, studies cannot just measure the effects of programs. They must also identify the reasons those effects occurred. From this perspective, it should be noted that an "unsuccessful" program can make as great a contribution to basic knowledge as a "success."

Resource Allocation. In DOE's resource allocation process, the Planning, Programming, and Budgeting System (PPBS) **evaluation can contribute data to support comparisons of options and selection of the most advantageous program alternatives.** This type of analysis requires evaluation information on the entire range of supply and conservation program options. **Projections of anticipated costs and benefits of both supply and conservation programs can be improved significantly as more is learned about actual cost and performance.** This information is particularly important to conservation programs, first since the effects of these programs are more difficult to document, and second because the program results are influenced by many variables, such as consumer behavior, that are not currently understood.

Ideally, cross-cutting measures of effectiveness would be used in these comparisons. Cost per barrel of oil equivalent and cost of energy service delivered have been suggested as criteria. It has also been suggested that unintended environmental, health, safety, and economic side effects also be included in these comparisons. Evaluative data can lead to increasing refinement and accuracy of these measures. The oil import premium concept and least-cost model, discussed in an earlier Section, are examples of analytical devices that depend to some extent on evaluative data.

---

*Examples of other evaluations of conservation and solar programs conducted by DOE, other Federal agencies, and state agencies are outlined in Appendix B.

Program Management. Of the various purposes evaluation can serve, providing feedback to managers to improve programs received the strongest support from participants in the Section 11 process. It is perhaps the most readily achievable objective for evaluation since these studies do not necessarily get enmeshed in problems of measuring impact and attributing causality. **A key objective of this type of evaluation is to provide timely feedback on aspects of a program that are amenable to change.** A major emphasis is identifying problems and recommending solutions rather than measuring ultimate impact. For example, an evaluation could assess the appropriateness of the methodology of a research program, the quality of materials and dissemination procedures in an information program, or the number and types of homes reached in a weatherization program. It could identify problems encountered by state energy offices in interpreting regulations or local agencies in complying with schedules and reporting requirements. **In short, evaluation can provide program managers with information needed to make "mid-course corrections" and maximize program efficiency and effectiveness.**

This type of evaluation can also be extremely valuable in designing new programs. For example, the new Residential Conservation Service should build upon the lessons learned in previous utility conservation programs, such as those conducted by the Tennessee Valley Authority and Pacific Gas and Electric. TVA found in one audit program, for example, that it was not difficult to generate interest in the program through an outreach effort, but that it was far more difficult to meet this demand than expected. As a result, they were unable to perform as many audits per month as anticipated and built up a substantial backlog of audit requests. TVA's experience should help RCS estimate how many audits it can perform and how it can organize to perform those audits most efficiently.

Accountability. Although evaluations can provide useful information for oversight and monitoring purposes, evaluation that is used to provide accountability can be the most threatening to a program manager for obvious reasons. Whenever the results of an evaluation are used in a public forum such as a Congressional hearing or newspaper article, they can easily be misused by a program's opponents or proponents. Few evaluations have clear, unambiguous conclusions, and all are subject to numerous caveats about their findings. Yet in public debates, their conclusions are often oversimplified and quoted out of context. Therefore, this is a particularly touchy use of evaluation.

As DOE officials respond to internal and external pressures to "do more evaluation," they must carefully sort out what they expect from evaluation and how it will fit into existing management systems. Above all, **expectations for the potential contributions of evaluation should be realistic.** In other fields, such as education and human services, large expensive studies were launched involving methodologically sophisticated research on program impact. But more was expected of evaluation than it could deliver because the data collected were not always as good as anticipated; this type of research is inherently conservative, tending to err toward a finding of no significant effects; and finally, political and bureaucratic opposition to evaluation was generally underestimated. Therefore, in many cases, evaluations were not able to detect the positive results anticipated from popular programs, and in other cases were unable to authoritatively attribute changes in the affected population to the program under study. As a result, many decision makers became disillusioned with evaluation and its ability to contribute to decisions.

The remainder of this Section discusses specific steps that DOE should take to ensure that evaluations are performed and used. It begins by suggesting elements of a department-wide policy that would guide evaluation activities. Then, it suggests ways of addressing some of the institutional and methodological barriers that may inhibit implementation of this policy. Throughout this section, EPA presents recommendations which are tempered by an awareness of the limits of evaluation. This does not represent equivocation on the **value** of evaluation — we believe that evaluation is crucial for developing the information Congress and DOE needs. However, we are equally firm in our belief that evaluation should not be oversold.

Evaluation Policy

If DOE is to produce consistent information on program effectiveness, departmental policy should be established regarding types of programs to be evaluated, department-wide information requirements, timing, roles and responsibilities of various offices, and funding mechanisms. All offices with a stake in the evaluation process should be involved in developing this policy.

Although the need for evaluation has been recognized by many within and outside DOE, overall guidance on conducting evaluations has not been provided to program managers and planning offices, nor has a funding mechanism been established. Because of the organizational and methodological barriers to conducting evaluations, many managers have been reluctant to initiate a major evaluation effort without such direction.

As is clear from the experience of other Federal agencies, developing an agency evaluation strategy and methodologies to support it are not simple tasks. Convincing managers and decision makers at all levels that evaluation can be a useful tool is perhaps even more difficult. Thus, **it is critical that those who will implement evaluations and those who will use their results be involved in developing this policy.** As an example of this type of involvement, CSE's Office of Policy, Planning and Evaluation has formed an Advisory Committee to assist in developing its Evaluation Plan. This group is composed of representatives of each CSE Deputy Assistant Secretary, and advises on issues such as evaluation criteria; requirements for evaluation methodology research and development; priorities and schedules for implementing the Evaluation Plan; and requirements for evaluation, guidelines, data sources and evaluation support.

Several topics should be addressed in a departmental policy on evaluation. These include criteria for setting priorities among programs to be evaluated, information to be produced, timing, definition of responsibilities, and funding.

Some type of evaluation may be required of all programs, but certain programs may merit greater emphasis than others. Thus, the procedures and **criteria used to set priorities among programs to be evaluated** are critical. Discussions with Section 11 participants and DOE officials suggested a number of criteria — the Section 11 workshop in Menlo Park developed a list of approximately twenty potential elements. The following items seem to be most useful.

- Is there a statutory requirement for evaluation? Even in these cases where evaluation is required though, decisions must be made on the type of evaluation to be conducted and the level of effort to be expended.

- Is the program significant in terms of high costs, visibility, potential energy savings, or potential impact on the environment, safety/health, or the economy? Is the program a candidate for expansion or greatly increased funding?

- Can the results of an evaluation influence decisions regarding the program? Evaluations should be tied to program and project decision schedules, and programs should be selected for evaluation so that information will be available when decisions are being made. Particularly high priority should be given to evaluating programs about which there is controversy.

- Can the evaluation be done? A great deal of time and money can be wasted on programs with unclear goals, uncooperative personnel, or large methodological barriers. These problems should be solved before an evaluation is attempted.

- Is the program's performance marginal or suspect? There should be a system of "red flags" — indicators that a program may be in trouble — that could suggest the need for an evaluation. These could include a series of missed milestones, unexpected costs, or erosion of industry interest.

- Is there a great deal of uncertainty about the program? New programs and pilot programs should receive priority.

- Is the program typical or can it yield information that will contribute to decisions on important issues? When information can be generalized to other programs or is needed for a specific purpose, programs should be selected to produce that information. DOE policy makers should try to anticipate major issues that are likely to arise and plan studies to generate information that will be needed in these debates. For example, the role of state and local government is likely to be an important issue in coming years, as is defining cost-effective approaches to equity questions.

A second element of an evaluation policy should address **the type of information to be produced and the evaluative criteria to be applied.** Criteria will vary by the purpose of the evaluation and by type of program. For example, evaluation to support resource allocation would be geared toward facilitating comparisons of program alternatives and selection of the best ones. For this purpose, comparable data on program costs and benefits would be most useful. A DOE evaluation policy should describe the uses to which evaluative information will be put department-wide, the specific data that will be required, and when the data will be needed. The more precisely these requirements are described, the more likely compliance will be. These elements should then be incorporated into guidance and instructions for PPBS, the Major System Acquisition process, and other appropriate management and reporting systems.

An **evaluation strategy should also address the issue of timing.** It is generally agreed that the best approach to evaluation is to build it into programs from the beginning, thus allowing for the collection of adequate baseline data and design of programs to facilitate evaluation. A key question regarding timing, however, is when to begin measurement and reporting. Evaluations of program outcomes should not be forced too early. For example, all programs have start-up costs, and costs of a program will often decline and then stabilize after the "bugs" have been eliminated. Further, the impacts of information programs and new standards or regulations are not felt immediately and premature measurement of results will underestimate their ultimate effects. Perhaps most difficult are R&D programs for which impacts may not be observable for several years.*

However, if evaluation results are to be useful, they must be available when decisions are being made. In general, studies that attempt to apply experimental or quasi-experimental designs require the longest time, and some decisions about the program will occur before their final conclusions are reached. In most studies, though, evaluators can provide some feedback fairly early, although data is not likely to be as comprehensive or as thoroughly validated as the final product. Case studies and descriptive data usually can be produced quickly and can be useful in many decisions.

---

* Two examples illustrate the delays in observable effects of R&D. A study of DOD R&D funded between 1945 and 1963 found that there was usually a 5 to 10 year delay before R&D investment paid off. Another study prepared for the National Science Foundation concluded that the delay in R&D payoff could be as long as 30 years. From John Salasin, et al., **The Evaluation of Federal Research Programs,** MITRE Technical Report MTR-80W 129, June 1980, page 30.

The evaluation policy should also **clearly define responsibility for initiating, overseeing and implementing evaluations.** Currently, there is inadequate delineation of the evaluation responsibilities of the Assistant Secretary of Policy and Evaluation, program offices, and staff offices (such as Conservation and Solar Energy's Office of Policy, Planning, and Evaluation).

There are many different organizational arrangements that can be employed and none is inherently better than the others. Responsibility can be delegated to program offices or the cross-cutting staff support offices, or it can be shared. One study of Federal evaluation policy suggested that "... responsibility for evaluation should be placed at a level appropriate to the decisions it is designed to assist..." and "... evaluations should be directed by persons not having a great deal to gain or lose from the outcome. Thus ... major responsibilties for evaluating projects and alternative strategies within the program should rest with program managers, but responsibility for evaluating the worth of an entire program should be placed above the program level."[*] The study goes on to recommend that where states and local governments are responsible for program implementation, they should be provided funds and technical assistance to conduct evaluative studies. Participants in a symposium on Federal program evaluation noted that "the threatening nature of evaluation may be the most important obstacle to its effective use... To overcome this, the panel believes in the importance of including 'victims' in all phases of evaluation projects from pre-design and planning through execution and product packaging."[**]

Participants in the Section 11 program were divided in their opinion. Some suggested that evaluations intended primarily to support resource allocation be conducted by the Office of the Assistant Secretary for Policy and Evaluation or the CSE Office of Policy, Planning and Evaluation, while studies intended primarily to support program management should be the responsibility of the appropriate program office. Other participants felt that the role of the Office of the Assistant Secretary for Policy and Evaluation should be limited to technical assistance and oversight, but that evaluations should be actually conducted by program offices. (The latter more closely corresponds to the current arrangement, and to the Evaluation Plan being prepared by Conservation and Solar Energy.)

The important point is that various offices understand what their responsibilities are and have the capability to carry them out. This implies that appropriate offices have staff available who can perform both contract management (assuming outside contractors perform at least a portion of the work) and technical oversight activities. Additional slots, staff training or technical assistance may be required to develop these capabilities.

In addition to defining responsibility within DOE, there was a great deal of consensus among Section 11 participants on the **need to involve state and local agencies in evaluation efforts** since a large portion of DOE's conservation programs are implemented and managed by these agencies. Further, variations in implementation strategies and methods provide an excellent opportunity for collecting comparative data. For states to play a role in evaluation, they will need technical assistance. A participant from a state noted for its efforts in evaluation suggested that DOE:

> "... provide technical assistance to the states by developing model evaluation components, computer software, and an evaluation handbook; improve its understanding of how states implement Federal conservation programs and, thus, what will appropriate evaluation requirements be (1) state - Federal staff exchanges and (2) creation of an evaluation advisory committee ... ; conduct basis research on conservation; and provide states with financial resources to develop baseline end-use data and to meet evaluation requirements." (Keith Kozloff, Minnesota Energy Agency.)

DOE should also involve utilities in its evaluation efforts for several reasons. First, utilities are a valuable, largely untapped source of data. Second, the utilities are increasingly involved in implementing their own and Federally-sponsored conservation and renewables programs and, therefore, have a stake in ensuring program effectiveness and management efficiency. Finally, utilities have a stake in evaluation as it can contribute information for the difficult decisions they face regarding investments in new capacity versus investments in reducing demand. For example, the recent decision by Southern California Edison to try to meet increased demand through a combination of renewable technologies and conservation instead of new coal projects demonstrates the persuasiveness of information. In this case, independent reports by the Environmental Defense Fund and the Department of Interior showed the cost-effectiveness of conservation and renewables when compared to the coal plants. Although other considerations certainly affected the decision, many believe that these reports played an important role. DOE's evaluation activities should be designed to assist the utilities as appropriate and to obtain useful data from them.

Finally, an **evaluation policy should address the issue of funding.** Evaluation should be viewed as an investment in information that will improve DOE's management and decision making capabilities. Evaluation is expensive, but as one Section 11 participant stressed, "we can't afford not to do it." The money for evaluation can come from various sources: normal budget requests, discretionary funds, a special agency-wide "tax" designed to support evaluation. Some Federal agencies require that a specific percentage of all projects be set aside for evaluation, which is one option for DOE to consider. Another option is for a department-wide evaluation budget, with particular evaluation studies negotiated in that framework.

---

[*] Joseph S. Wholey, et al., **Federal Evaluation Policy,** Washington, D.C.: The Urban Institute, 1976, p. 116

[**] Eleanor Chelimsky, **An Analysis of the Proceedings of a Symposium on the Use of Evaluation by Federal Agencies, Vol. II,** MITRE Report M77-39, July 1977, p. 22

The Office of Technology Assessment* recommended that five to ten percent of total program funds be set aside for evaluation. In testimony at the Section 11 National Hearing, a witness with evaluation experience in a number of Federal agencies estimated that six percent of program costs may be necessary for start-up of evaluation activities, and that one and a half percent would be needed after program operations have stabilized.

Institutional Barriers to Implementation

Successful evaluation requires an environment that is receptive to new information and open to change. To foster this type of environment, top DOE management must demonstrate their commitment to using evaluation results and develop incentives for good evaluation at all levels of the department.

Adoption of evaluation as a management tool within DOE will require more than establishment of a policy. Although a policy may be successful in obtaining compliance with its paper requirements, it cannot ensure that evaluation results actually are used in decision making. Participants in the Section 11 program emphasized that **this will require a serious commitment from senior officials, and evidence that their commitment** has led to action. They must be willing to ask difficult questions about the worth of programs, and act on the answers. This does not imply, of course, a one-to-one correspondence between evaluative results and actions taken, because many other factors must be considered in decision making; it does mean, however, that decisions may require more detailed justification when they appear to run counter to evaluative information.

There is a great deal of institutional resistance within any organization to evaluation and use of its results. When approached improperly, evaluation is viewed as a threat or a punishment, and obtaining accurate data can become virtually impossible. This is particularly relevant for DOE, because it has been under fire since its inception. As a Section 11 participant noted, "criticizing DOE for our energy problems has become a national pastime only slightly less ubiquitous than baseball." Thus, it will be critically important **for DOE managers to build in incentives to establish support at all levels of the organization.** Several types of incentives should be developed.

First, **program managers should be rewarded for conducting high quality evaluations and acting upon their results.** This does not mean that managers should only be rewarded for positive evaluations; on the contrary, greater incentives should be provided for routinely identifying problems within programs and projects, and attempting to resolve them. Evaluative studies should be designed to complement this incentive structure. Instead of the "gotcha!" approach which some evaluators enjoy, program managers should be involved at all stages of the study, and should receive regular feedback from the researchers. Evaluation can be sold to program managers as a means of staying one step ahead of criticism.

Another type of incentive regards the status of evaluation and those who do it. One Section 11 participant noted that "there is a bit of a tendency to talk about evaluation as if it just 'happened,' without our having to pay much attention to who was doing the work." He went on to stress the importance of "establishing evaluation as a high-status occupation within the energy business, in order to attract to it some of the very best talent, not just the left-overs from more 'important' work." **In addition to raising the status and caliber of evaluators, users of evaluative information should be more knowledgeable, thus making them a more competent and supportive audience.** Specific actions which DOE should consider to promote this type of incentive are in-service training and support for other forms of education; establishing published professional literature on energy program evaluation; supporting workshops and conferences among energy program evaluators within and outside DOE (such as state and local agency staff, utility program evaluators, etc.), and between evaluators of energy programs and evaluators from other fields.**

One incentive for all levels of management would be removal of two barriers to use of evaluation. First, it could be made easier for programs to be changed in response to evaluations. In some instances, there may be fewer requirements and more discretion over program design or operation so that improvements can be made. Inflexible program requirements discourage use of evaluation. For example, some of the problems discovered by formal and informal evaluations of DOE's state and local assistance programs cannot be readily corrected because they arise from legislative requirements. **A second change is greater use of pilot programs and small scale demonstrations.** Prior to full scale implementation of a nationwide program, it should be tested and carefully evaluated. This would result in many problems being averted. The phase-in of the Energy Extension Service provides a model for this approach.

---

* Office of Technology Assessment, **Conservation and Solar Energy Programs of the Department of Energy: A Critique**, GPO No. 052-003-00757-6, p. 21

**For example, during the Section 11 program, thirty-five experts in energy program evaluation and evaluation of health, welfare and education programs met for a day and a half to discuss evaluation of conservation and solar programs and lessons to be learned from other fields; participants felt strongly that this was an extremely useful meeting and urged DOE to conduct follow-up activities.

Methodological Barriers to Implementation

Evaluations should focus not only on program impact but should also examine program processes, and evaluators should employ both quantitative and qualitative techniques in these assessments.

Evaluation is often viewed only as an assessment of impact. In energy program evaluation, this perception may be narrowed even further when users expect evaluation results to be reduced to a single figure such as cost per barrel of oil equivalent. But to enable evaluation to fulfil an expanded role within DOE, **it should focus not only on program impact but should also examine program processes.** This will provide information both on program results and the reasons for them. Decision makers need to understand why a program worked or did not work, and which program elements were responsible for success or failure. If a program works, others will want to imitate it, and they need to know what features to replicate. For example, DOE's evaluation of the Energy Extension Service pilot programs focused on which programs worked best and why. It was able to identify the types of services that were most effective and the target audiences that found these services most useful.

For many conservation programs, evaluation of results is a very difficult task. Whereas a supply program can point to a demonstration plant capable of producing a given quantity of fuel per day as an indicator of success, conservation programs must attempt to document energy savings. Serious methodological barriers inhibit efforts to define and measure energy savings, and to authoritatively attribute these savings to a particular program. Examples of these barriers include the following:

- **Defining Measurable Outcomes.** Defining outcomes to be measured requires agreement on a clear set of program goals and objectives. But goals are often not described in measurable terms. For most conservation programs, "energy savings" is posited as the desired result. But energy savings are not always measurable, especially in the time frame required.

- **Establishing Causality.** Classical research designs employ experimental methods with control groups to clearly establish cause-and-effect relationships among independent and dependent variables. In the real world, however, it is virtually impossible to create such a "laboratory" situation and various techniques are substituted for the ideal. The generic issues concerning causality can (and do) fill many research textbooks. Problems specific to conservation and solar programs include the difficulties in controlling for external variables, regulations that limit flexibility to introduce planned variations into programs, and inability to randomly select program participants or assign them to participant and control groups. Lack of an adequate data base regarding energy consumption generally and in various end-use sectors exacerbates this situation.

- **Collecting Valid, Reliable Data.** Few mechanisms exist for gathering information on actual behavioral changes and changes in consumption or efficiency. Most studies rely on self-reported data, which is notoriously unreliable. Respondents tend to give answers they believe are desired by the questioner, which can seriously skew the data. It is difficult to estimate and correct for this bias.

- **Interpreting the Data.** Because so many factors can affect energy consumption and so little is understood about them, it is sometimes difficult to interpret evaluative results. In residential audit programs, for example, installation of conservation measures does not always result in saved energy. This can occur because of increases in the number of people in the house or because residents were able to increase their comfort level (e.g., turning up the thermostat) or increase their activity level (e.g., open up unused rooms) for the same price. Without additional understanding of consumer behavior, interpreting even a relatively clear indicator, like energy savings, becomes difficult.

To design successful evaluations which will address these barriers and respond to identified information needs, **studies must be tailored to specific programs**—no single methodology can be applied to all programs. DOE supports a wide variety of programs, such as basic research, information dissemination, communication and marketing, grants, standards and regulations, each of which involves different activities and objectives. Evaluations must be designed to address each program type's goals and components. For example, data collection techniques for a basic research program on properties of materials or the physics and chemistry of an industrial process would differ from data collection techniques for an informational program, such as the Energy Extension Service or the Low-Cost/No-Cost Project. Similarly, regulatory programs and standards, such as Building Efficiency Performance Standards and grants programs, such as Weatherization Assistance, will differ. Therefore, although guidelines and policies for evaluative information and minimum criteria can be articulated, flexibility must be retained so that evaluation designs can accurately assess these specific programs.

The barriers discussed for DOE programs suggest that **quantitative studies of impact should be augmented by examination of processes and non-quantitative measurement techniques.** Quantitative methods exist for measuring some program impacts and should be used whenever possible. However, this information can be further enhanced through measurement of intermediate results (program outputs, such as numbers of people contacted) and case studies. Case studies are particularly useful in helping to lay the groundwork for testing hypotheses, as a preliminary activity to more rigorous evaluation, and as a means for providing guidance and constructive recommendations to managers. "Put another way, evidence based on statistical analysis of desirable project characteristics is not understood or trusted by program managers. Short case studies which contain essential elements of success give program managers much more information and more evidence that the contractor's understanding is deeper and does not reflect what they view as simple statistical manipulations."[*]

As a corollary to the above, **alternatives to traditional experimental designs should be explored.** Evaluation methodology is itself a potential target for R&D activities. Effort should be focused on developing credible, feasible research design and measurement techniques, and data collection methods. This developmental work could draw extensively from recent research in other fields, and the peer review mechanisms currently in place.

Finally, **more comprehensive data on energy use and energy using systems should be developed.** It is difficult to interpret the results of evaluations without adequate information about the environment within which programs operate. Compiling such data bases on consumption and capital stock in each-end use sector is, however, expensive and time-consuming. Further, these data require periodic updating if they are to be useful. The Energy Information Administration (EIA) is currently working on improving and expanding data available through a National Interim Energy Consumption Survey covering all four end-use sectors, and specific studies within each sector. Several Section 11 participants suggested that EIA should draw more extensively on utility data as well. EIA could become a valuable partner in evaluation as well as data collection activities by providing data needed to describe the context within which programs operate. For example, the evaluators of the Weatherization Assistance Program, currently in a planning stage, worked with EIA to insert several questions into the Residential Energy Consumption Survey. This will save money for the evaluation while not increasing EIA's costs substantially, and will provide very useful data. Evaluators should carefully consider ways they can tap this valuable resource. EIA could also assist evaluation efforts by incorporating results of evaluative studies into its data base, comparing and reconciling the conclusions about individual program impacts.

In addition to organization by end-use sector, EIA's data base activities could also be geared toward the needs of state and local agencies. A significant portion of the planning and management of conservation programs is performed by state energy offices, local agencies and utilities. These state and local agencies frequently do not have the capability to build and maintain adequate data files. Section 11 participants emphasized that this could contribute significantly to enhancing their ability to ensure program efficiency and effectiveness.

---

[*] Eleanor Chelimsky, **An Analysis of the Proceedings of a Symposium on the Use of Evaluation by Federal Agencies, Vol. II**, MITRE Report M77-39, July 1977, p. 22.

Appendices

Preceding page blank

A. Summaries of Public Participation

National Hearing Summary

The Section 11 National Hearing was held in Washington, D.C., on September 24 and 25, 1980. The Hearing panels included the Assistant Secretary and three Deputy Assistant Secretaries from the DOE Office of Conservation and Solar Energy; the Deputy Assistant Secretary for conservation from the DOE Office of Policy and Evaluation; representatives from the Environmental Protection Agency and the Office of Management and Budget; Congressional committee staff; the Congressional Office of Technology Assessment, state governments, solar and conservation interest groups, utilities, and industry. Thirty witnesses presented testimony, and five additional participants subsequently submitted written testimony. Witnesses represented a broad spectrum of interests and backgrounds, including industry, environmental organizations, solar and conservation public interest groups, research organizations, universities and research laboratories, and state and local governments. Many of the participants had attended one of the Section 11 workshops and meetings held earlier this year.

Prior to this Hearing, witnesses were sent materials discussing the focus of this year's Section 11 activities and the major issues that emerged from the workshops. Most of the witnesses addressed one or more of these issues in their testimony. This Appendix summarizes comments from the National Hearing, and is divided into four sections that correspond to the four sessions of the Hearing — Policy, Evaluation, State and Local Programs, and Research, Development, and Applications. The Appendix is not intended as a comprehensive record of all the issues addressed in the witnesses' testimonies; for the full record, a complete transcript of the Hearing has been published.

Policy Analysis

The first Hearing session dealt with conservation and solar policy at DOE, and the ways that policy translates into actual programs of research and development, commercialization, or other applications.[*] The witnesses all expressed concern over the gap between the ambitious policy goals established for conservation and solar and the current level of support these technologies receive in DOE's programs. If DOE's stated goals for these technologies are to be met, the witnesses agreed, support for conservation and solar will need to increase substantially.

Need for Conservation and Solar. There was general agreement among the witnesses about the need for expanded use of conservation and solar. Some saw conservation and solar as the quickest, least expensive means of reducing our dependence on foreign oil and improving national security as well as the economy. Other witnesses stressed the unacceptable environmental consequences of continued supply expansion. All witnesses saw substantial opportunities for investments in conservation and solar that are economically preferable to fossil or nuclear technologies, and it was repeatedly emphasized that large economic savings are available through conservation and solar at today's energy prices. For example, Henry Kelly, head of the Analysis and Applications Directorate at the Solar Energy Research Institute (SERI), outlined the results of recent research conducted at SERI and Lawrence Berkeley Laboratory into the potential for energy conservation in buildings. It will be technically feasible and economical, he said, to reduce energy demand in the buildings sector by a factor of two over the next 20 years without constraining building construction or decreasing comfort levels. He contended that the impact of a coherent program to save energy in buildings could be as large as any national program to supply energy from other sources.

There were differences in opinion among the witnesses about the barriers to and incentives for conservation. Some witnesses held that conservation decisions are made primarily in response to higher prices. Other witnesses, while acknowledging the importance of the price incentive, pointed out that many barriers exist that reduce or prevent energy consumers from responding to price alone, such as the lack of skilled energy auditors, inadequate incentives for utilities to invest in conservation, and a lack of consumer awareness concerning economic investments in conservation.

Role of Government. All the witnesses agreed that the Federal government should play a role in encouraging conservation and solar; as with other issues, however, there were differing views on what that role should consist of.

Alvin Alm, from the John F. Kennedy School of Government at Harvard University, and other witnesses considered the government's primary function in energy policy to be enhancing competition and the operation of the free market for all forms of energy, including conservation. He perceived a need for government involvement in conservation beyond supporting competition, though, pointing out the numerous market imperfections that constrain conservation. He also argued for providing subsidies to conservation

---

[*] This section includes the testimony of some witnesses who participated in the Research, Development, and Applications session, as their remarks on DOE's program balance complement those of the Policy Analysis session witnesses.

Preceding page blank

to offset the hidden costs of imported oil to our national security, costs that the market does not pass on to consumers. Steven Carhart, from the Mellon Institute in Arlington, Virginia, said that government programs to develop and commercialize technologies should complement private efforts in the same areas, focusing on activities that the private sector is not willing to pursue on its own because of high risk or low return on investment.

> "The implication of this is that under non-emergency conditions the role of the Federal government will be primarily to maintain and enhance the competitiveness of that market, to remedy market failures as they are identified, and to deal with the externalities related to energy." (Steven Carhart, Mellon Institute.)

Other witnesses had less confidence in the ability of the free market to adequately address energy problems. David Brower, of Friends of the Earth, discussed the market's effect on three critically important issues:

> "The danger of atomic war, a policy for using the world's natural resources, and nationalism. . . . Energy is deeply involved in every one of the three. And the free market, which seems to have been looked longingly to (in the Section 11 workshops) has a perfect record of exacerbating each of these three problems." (David Brower, Friends of the Earth.)

Instead, Brower said that we need a "new pair of glasses" that will enable us to see the energy problems from a more global perspective that includes resource depletion, environmental degradation, and overall quality of life.

Most witnesses agreed that DOE's role in conservation and solar energy should encompass a wide range of activities, including: research and development on new technologies; use of the tax system to structure incentives for conservation and solar; experiments in new institutional mechanisms for delivering conservation and solar technologies; grants to states and localities aimed at building local capacity; and dissemination of information on solar and conservation.

Resource Allocation. Several witnesses focused their testimony on the need for DOE to base its resource allocation decisions on more rational, systematic comparisons between supply and conservation programs. There was consensus that cross technology comparisons do not play a significant role in DOE's decisions, and in the absence of such comparisons, conservation and solar programs remain underfunded relative to the contribution they could make to our energy needs.

This lack of systematic comparison ran counter to what many of the witnesses felt should be the basis of DOE's policy. Carhart pointed to the Mellon Institute's Least Cost Energy Strategy as a method of cross technology comparison. He described the least cost approach as a process which identifies society's end-use energy needs — heated buildings, mobility, etc. — and then identified the mix of technologies which meets those needs at the minimum cost. An important element of the analysis, he stated, is the inclusion of hidden costs such as environmental impacts in the overall cost of each technology. The analysis thus reveals the least cost strategies in social terms, not merely economic terms.

Alvin Alm saw the need for an analytic tool based on the cost of imported oil to use in comparing and selecting energy programs. He explained the concept of the oil "premium" price — a price somewhere above the market price which would incorporate the external costs to our national security of importing oil — and recommended using that price as a cost yardstick against which to measure proposed energy programs. The premium price would represent the value that society places on reducing oil imports; used as a policy tool, it would ensure that any government program aimed at reducing imports would have to show a lower cost-per-barrel than the world price of oil plus the premium.

Joel Darmstadter, from Resources for the Future in Washington D.C., expressed concern that DOE has become preoccupied with quantified energy targets for the various energy technologies, often set in isolation from other technologies. Programmatic goal-setting, he argued, has to be based on cross technology comparisons and cost-benefit analyses, or else the targets remain arbitrary. In addition, he argued that the target-setting process needs to allow for adjustments in targets over time to fit changing economic and technological conditions.

Other witnesses stressed that cross technology comparisons should involve more than quantitative cost-benefit analyses of competing energy technologies. Janice Hamrin, from the California Energy Commission, spoke of the need for comparisons and allocation decisions to include qualitative considerations.

> "If energy is not an end in itself but rather a means to an end, that end being the human quality of life, then the allocation of resources for the DOE should be based on some criteria that include a comparison of the cost-effectiveness of meeting specific end-use needs." (Janice Hamrin, California Energy Commission.)

Evaluation

The second Hearing session focused on the role of program evaluation in conservation and solar programs. The witnesses agreed on the need for an ongoing evaluation effort within DOE's conservation and solar programs. With increasing fiscal conservation in Congress and the likelihood of slower growth for the conservation and solar budgets, one witness stated, there will be closer scrutiny of the various programs for their cost-effectiveness and results. Evaluation can play an important role in budget and other resource allocation decisions. Evaluations which examine program processes as well as results were seen as valuable tools for program managers in directing their programs most effectively. Another witness cited the role of program evaluation in demonstrating the credibility of solar and conservation as alternatives to nonrenewable supply technologies.

In general, conservation and solar programs have received little or no evaluative attention. Eric Hirst, from Oak Ridge National Laboratory, commented that this lack of effort has stemmed to a large degree from the relative newness of the programs, along with the crisis atmosphere that pervades most offices at DOE.

Much of the witnesses' testimony focused on barriers that have limited the role evaluation plays in DOE's conservation and solar programs. Four of the barriers given most attention in the testimony are briefly described here:

Lack of Consensus on Program Purposes. Witnesses agreed that a prerequisite for successful evaluation is the clear identification of program purposes and goals by which program effectiveness can be judged. In many conservation and solar programs, though, these purposes have been ambiguous, obscure, or controversial.

> "During the 'apple pie' phase of the past several years, conservation and solar programs enjoyed a very broad political constituency. But a broad political base is necessarily comprised of many groups with unrelated or incompatible political objectives. The very existence of such a variegated coalition makes explicit definition of program purposes difficult and politically hazardous." (Louis Perelman, Jet Propulsion Laboratory.)

As a means to overcome this barrier, Joseph Nay, from the Performance Development Institute in Washington, D.C., described a process for developing consensus among various stakeholders in a program. During the initial phases of program evaluation, he explained, evaluators attempt to identify the range of program expectations held by the stakeholders. At the same time, the evaluators collect data on the program's performance and effects, developing a picture of what the program is actually doing. Working with the program staff, Nay said, the evaluators compare expectations against each other and against the actual program results in a continual process that allows program managers to better understand the program, and how to adjust expectations or make changes to the program so that expectations and results become closer.

> "There is a fascination in seeing the rhetorics of expectation compared more and more closely with actual processes and outcomes and then related through common frameworks to other programs. This generates interest from most stakeholders involved and often leads to convergent opinions rather than divergent arguments." (Joe Nay, Performance Development Institute.)

Acceptance by Program Staff. Several witnesses addressed the problem of obtaining acceptance and participation in evaluation by program managers and staff who often see evaluation as a threat to the program and its budget. Eva Baker, from the Center for the Study of Evaluation of UCLA, emphasized the importance of educating program staff in the techniques and uses of evaluation, pointing out that many, if not most, DOE staff have not been involved previously with programs where evaluation was a standard practice. She also suggested that the evaluations be structured to assist managers in making program improvements, rather than being aimed primarily at higher level decisions on allocating resources between programs, so as to minimize the threat that evaluation results will be used against the program, while maximizing the usefulness of the evaluation results to the program manager.

Keith Kozloff, from the Minnesota Energy Agency, emphasized the need for involving the program staff in every phase of an evaluation so that evaluation becomes an integral element of the program instead of a task imposed on the program from outside. The process of matching stakeholder expectations with actual results, described by Nay earlier, is also intended to promote staff acceptance and participation in evaluation.

Lack of Commitment from Top Management. All witnesses identified the lack of top DOE management commitment to evaluation as a prime barrier to its use in conservation and solar programs. Given overcommitted program staffs and high turnover rates among program managers, there is little incentive for managers to perform evaluations. Without direction and commitment of sufficient resources to address these problems from upper management, the witnesses agreed, program evaluation will continue to receive a low priority in most conservation and solar offices.

Evaluability Problems. One barrier to evaluation that all witnesses spoke of was that of methodological problems. Many activities in conservation and solar such as R&D programs pose substantial problems to evaluators trying to assess program results. Several witnesses observed that measuring the impact of government spending in conservation is particularly difficult, due to the simultaneous influence of rising energy prices and other economic factors on energy consumption decisions. The witnesses pointed out that evaluation of conservation programs is hampered by our current poor understanding of what motivates people to conserve energy. They emphasized the need for developing better disaggregated data on energy consumption trends as well as research into the actual savings to be expected from various conservation measures.

In addition to discussing barriers to evaluation, witnesses addressed criteria which should guide selection of programs to be evaluated. Most witnesses felt that not all programs in conservation and solar should receive formal evaluation. Several criteria were suggested for choosing programs to be evaluated, including program size, controversy, willingness of staff to participate constructively, and feasibility of measuring program results. One witness felt that managerial flexibility should also be considered: where managers are constrained by restrictive program legislation, evaluation findings may not be translated into improved program structures and processes.

Witnesses involved in state and local conservation programs voiced concerns for evaluation efforts being carried out at those levels. There was agreement that DOE has an important role to fill in assisting states, localities, and utilities in evaluating their conservation and solar activities. Barbara Barkovich, from the California Public Utility Commission, spoke of the need for better evaluation techniques that the utilities can apply to their conservation programs. Keith Kozloff felt that DOE should be helping states to build evaluative capabilities by developing model evaluation techniques, performing basic research into conservation motivation, and providing funds for collecting state level energy consumption data.

While calling for stronger evaluation efforts within conservation and solar, several witnesses cautioned that evaluation should not be "oversold." Given the inherent difficulties of attaining clear results when assessing many conservation and solar programs, it was felt that moderate expectations should accompany program evaluation. One witness pointed out the limits of evaluation:

> "For the most part, evaluation will not always deliver clear and unequivocal data; sometimes reality does not come so packaged. Evaluation will not, by itself, save or kill programs." (Eva Baker, Center for the Study of Evaluation, UCLA.)

State and Local Programs

In the third Hearing session, witnesses from state and local governments, utilities, and public interest groups testified on issues and problems related to DOE's state and local assistance programs in conservation and solar.

State and Local Roles. Several witnesses discussed the roles of state and local governments in energy conservation. The major theme that emerged was the need for building capacity of local governments to implement conservation programs.

Ann Cline, an energy planner for the city of Richmond, Indiana, explained that state level outreach programs such as the State Energy Conservation Program (SECP) and the Energy Extension Service (EES) succeed in proportion to the ability of local communities to use that help. Local governments, she said, have advantages of formal and informal local connections that make them better suited than state governments to involving people in conservation programs. However, most local governments lack cohesive, purposeful organization with which to approach energy problems. Cline argued that the problems states have had with DOE in these programs would be less consequential if stronger partnerships existed between states and localities. She believed that the Energy Management Partnership Act could do more to further this partnership and assure success of state programs than any other foreseeable initiatives of the next few years.

Alec Wisch, head of the energy division of the Allegheny County (Pennsylvania) Department of Planning, criticized the lack of knowledge he perceived among DOE staff concerning state and local government processes. He felt that DOE should be reviewing other Federal programs to learn from their successes at building local capacity and encouraging efficient local programs. Wisch argued that DOE should deal directly with local governments as much as possible, rather than sending locally-targeted grant monies through the states. He felt that state involvement in grant distribution adds only further expense and an additional layer of bureaucracy to many programs. Acknowledging the impracticality of DOE's directly dealing with all local governments, he suggested that at least the larger energy-consuming counties and cities be supported directly, pointing out that Allegheny County, a heavy industrial area, uses more energy than 23 states.

Lee Callaway, from Pacific Gas and Electric, discussed the importance of the Federal role in facilitating information sharing among localities, states, and other local conservation providers such as utilities. He saw much potential for reducing redundant efforts through information sharing, as well as providing knowledge and techniques to organizations that lack that ability or motivation to devise their own approaches to conservation programs.

Related to the issue of local capacity building was that of public participation in conservation and solar programs. Barbara Brown, from the Florida Solar Coalition, testified on the importance of public understanding and cooperation to the success of conservation and solar programs, particularly since these technologies depend so much on consumer acceptance. She contended that DOE and state governments do not adequately acknowledge the role that public interest groups play as vehicles for public concerns in conservation and solar, nor do they adequately involve these interest groups in program planning and implementation.

Residential Conservation Service (RCS). The RCS is intended to reach 60 million American households with energy audits and other assistance designed to encourage the purchase and use of conservation measures, including renewable energy sources. Utilities will play the key role in implementing RCS. States have the responsibility of developing plans by which the utilities will design and manage their programs, and DOE oversees and approves the state plans, as well as providing management assistance to the states and utilities. Under the present time table, most utilities will begin their services in spring 1981.

Robin Calhoun, of HDR Associates, devoted her testimony to the RCS program, detailing the weaknesses she has observed in the legislation and the regulations being developed to guide the program. Her comments reflected the opinions of many workshop participants and covered three broad issues that she considered particularly important to the success of the RCS: program funding, policy, and implementation.

Regarding program funding, Calhoun saw the current $5 million appropriated for 1981 as reflecting a lack of commitment on the part of Congress to conservation. Observing the lack of Federal assistance to states and utilities for the RCS, she stated that the program will fail to meet its goals unless substantially greater sources of Federal funds are made available. Conservation, she stated,

> "...is not simply a word, a belief, or a commitment. It is a reality — a complex, dispersed domestic energy resource which is available at a price. That price is not $5 million for a program such as the RCS." (Robin Calhoun, HDR Associates.)

Calhoun also criticized Congress for having loaded the legislation authorizing RCS with excessively detailed program requirements. She felt that the states and utilities are in the best position to decide on program methods and strategies, and that Congress should limit its role to setting overall policy and program goals, with responsibility for the attainment of those goals entrusted to DOE. For example, the required listing service, she contended, is unnecessary and a potential disincentive for contractors who would be providing services to homeowners. Instead the program should be focusing on incentives for participation, such as conservation measures during the course of an audit, which provide an immediate benefit to the customer. Calhoun recommended that Congress hold oversight hearings immediately to examine those provisions which are overly restrictive, and act as soon as possible to simplify the requirements.

Weatherization Assistance Program (WAP). DOE's Weatherization Assistance Program currently exists as a $200 million per year grant program that provides subsidies for the weatherization of low-income households. DOE makes grants to the states, which then distribute the funds to local governments and non-profit organizations. Three witnesses at the National Hearings commented on WAP: Timothy Wilson, director of the Maine Division of Community Services; Lee Callaway, director of conservation programs at Pacific Gas and Electric, in San Francisco; and Samuel Sperry, from the Seattle Energy Office.

One issue addressed by Sperry and Callaway was the need for coordination between WAP and other residential conservation programs, such as the Residential Conservation Service at the national level, and local initiatives such as Seattle's Weatherization Plan. The witnesses emphasized the importance of program coordination in order to minimize duplication of services and redundant efforts. Both witnesses urged DOE to encourage this type of local cooperation primarily by building more flexibility into the WAP (and RCS) regulations, so that local and state governments can structure the program delivery mechanisms in locally effective ways.

As another means of improving WAP, Wilson recommended that DOE make more use of its authority to reallocate funds from states with lagging weatherization efforts to states needing additional funds. Reallocation, he stated, can be an important tool in motivating low-performance states to improve their programs, while at the same time increasing the effectiveness of WAP funds by rewarding the states that can best use them.

Both Wilson and Callaway called for a balance between WAP and the Low Income Energy Assistance Program (LIEAP), a $1.8 billion grant program which subsidizes low-income fuel bills. Both witnesses recognized the need for LIEAP assistance, yet argued that investing those same funds in weatherization would be a better investment in energy security.

Institutional Buildings Grants Program (IBGP). Authorized by Congress at $900 million over three years, the IBGP provides matching grants to schools, hospitals, and units of local government for energy audits and conservation retrofits. Local institutions apply for the grants, which are made available on a 50 percent matching basis by DOE through their state's energy office.

Two witnesses commented specifically on the IBGP: Robert Pauls, energy coordinator for Carbondale, Illinois, and John McMillan, energy coordinator for Hennipin County, Minnesota. Both witnesses viewed the program as useful and worth continuing with certain modifications. McMillan applauded IBGP for having provided the basic ingredient for a systematic evaluation of institutional buildings, as well as a method for prioritizing conservation improvements. He saw IBGP as an incentive particularly for small governments and institutions which would probably not be conducting energy audits and keeping energy consumption records without Federal funds.

According to McMillan, one of the program's major weaknesses is the lack of assured funding for future years. The IBGP is currently funded on an annual basis, which is causing problems for local governments, since they need to budget their matching funds well in advance of the fiscal year during which they will be spent. He recommended that Congress authorize funds for IBGP on a multi-year basis.

Both witnesses were concerned by what they saw as the unnecessarily complex and expensive procedures for applying for IBGP grants, particularly for small units of local government. McMillan felt that the data requirements of grant application were inappropriate to the size of most IBGP grants, many of which are under $5,000. Pauls cited examples of local governments which had declined to apply for a grant based on their assessment of the expense and time that would be involved in the application process. As a remedy for this potential disincentive to participation, it was recommended that grant application and reporting procedures be simplified for small grant applications.

Research, Development, and Applications

In the afternoon session of the September 25th Hearings, seven witnesses testified on a variety of topics related to how DOE carries out its research and development activities in solar and conservation. These topics, which included information dissemination, DOE's role in innovation, and program balance, had been previously discussed at the Section 11 Workshop held in Denver on July 24 and 25, which several of the Hearing witnesses attended. Since much of the testimony concerning the program balance topic is closely related and complementary to the issues addressed by the Policy Session witnesses, program balance testimony is summarized in the earlier section.

Information Dissemination. Joan Habib, from the Franklin Research Center, which manages the National Solar Heating and Cooling Information Center (NSHCIC), devoted her testimony to the recommendations on information dissemination developed by the work group she had participated in at the Section 11 Workshop in Denver, Colorado (July 24 and 25). The recommendation dealt primarily with ways to coordinate the many programs and organizations that disseminate conservation and solar information. The work group had agreed that the variety of existing information programs creates confusion among information seekers, especially since distinctions in function between the programs are unclear or nonexistent.

Habib felt it critical to streamline and coordinate responsibilities of these programs to provide a more efficient, comprehensible information network. She also emphasized the need for combining solar and conservation information in all programs, pointing out that the technologies and principles involved in both areas are inextricably linked, and therefore logically dealt with as a whole. As an approach to coordinating and integrating the information programs, Habib outlined the work group's recommendation for dividing information functions among the major programs and organizations. NSHCIC, they recommended, should become the primary entry point in the solar and conservation network for inquiries from the general public, providing coordination and referral services as well as a broad range of general information. The Solar Energy Information Data Bank, managed by SERI, should serve as the main source of technical information on both conservation and solar. The Regional Solar Energy Centers, another major actor in solar information dissemination, should focus their services on information appropriate to their regions, particularly information relating to technology marketing. Habib summed up the work group's consensus:

> "I would suggest that if our goal is to promote solar energy and conservation in a cost effective manner, the existing organizations, streamlined, coordinated, and with enhanced conservation input, are the best framework on which to build." (Joan Habib, Franklin Research Center.)

Marvin Yarosh, from the Florida Solar Energy Center, addressed the issue of information adequacy in current government efforts to promote solar energy. The present policy of encouraging the use of solar, he said, is proceeding without valid information on the quality or performance of commercial solar technologies — a situation he feared could damage the government's credibility among consumers. Yarosh questioned the wisdom of aggressively promoting a technology such as solar without knowing how commercially installed systems are performing.

> "If the government is actively engaged, as it is, in encouraging solar adoption, then it incurs some degree of responsibility towards the likely impact on those consumers that follow government advice and commit to solar. Fragmentary information which is available suggests that conventional wisdom concerning solar system performance may be seriously in error." (Marvin Yarosh, Florida Solar Energy Center.)

Yarosh said he believed that most problems with commercially installed solar systems are correctable with the various tools government has available—performance standards, licensing programs for manufacturers and installers, etc. —but that first information is needed to determine where the problems are. He urged expanded efforts at monitoring solar systems, emphasizing the importance of monitoring private, commercially installed systems rather than the government demonstration systems which have been the primary object of monitoring activities to date. Most demonstration systems, he observed, are not characteristic of current equipment and practices in the solar energy industry.

Innovation. Jerry Plunkett, head of the Montana Energy Research and Development Institute, devoted the majority of his testimony to the need for innovation in the energy field and to DOE's role in supporting innovation. Other witnesses also commented on innovation issues. Plunkett contended that DOE, for a variety of reasons, has not been committed to pursuing radical innovation in solar and conservation. He argued that the need for new approaches to energy supply and use are particularly acute now, but instead, DOE has tended to fund low-risk, low-innovation technologies. This is due, he said, to factors such as conservative attitudes on the part of program managers, and detailed, inflexible program plans which leave little room for receptive responses to unsolicited ideas.

Plunkett was particularly critical of DOE's involvement with individual inventors and small businesses. Citing the 1972 Sharply Report, which showed that at least 50 percent of innovations having a major impact on the economy came from individuals or small businesses, Plunkett pointed out that the most of DOE's R&D money goes to large firms. He expressed concern that small businesses and individuals are not adequately involved in DOE's R&D, and stated that their participation should be actively solicited if innovation is a goal of DOE.

One of the major barriers to small business involvement in DOE, Plunkett continued, is the procurement system, which discourages small business participation in several ways, including slow decisionmaking on contract awards and delays in contract payments. As an alternative, Plunkett recommended that DOE fund a number of private innovation centers, which would promote energy-related innovation by assisting small businesses and inventors to bring their inventions to the market. As an example of how these innovation centers could work, he pointed to the Center for Innovation located in Butte, Montana, an independent organization funded by five western states to support local businesses in a wide variety of activities aimed at commercializing new inventions.

Workshops and Meeting Summaries*

Section 11 of the Federal Nonnuclear Energy Research and Development Act of 1974 requires that EPA hold public hearings as part of its annual review of DOE's research and development activities. Recognizing the importance of meaningful public participation in the Section 11 process, EPA chose to hold a series of five public meetings in addition to the National Hearings for this year's review. These meetings, which were attended by approximately 150 people representing state, local and Federal government, research organizations, public interest groups, industry, universities and other organizations, have played an important role in the Section 11 review.

Participants in each meeting were asked to discuss specific aspects of DOE's conservation and solar programs and decision making processes, identifying their strengths and weaknesses and then developing recommendations for their improvement. The results of these meetings have served as the basis for EPA's conclusions and recommendations to the President and Congress in this year's Section 11 Final Report.

This Appendix contains summaries of each of the five meetings. The Durham meeting examined how DOE sets policy and goals for the conservation and solar programs. The Menlo Park meeting explored the uses and need for program evaluation in DOE's solar and conservation efforts. Two of the workshops, in Minneapolis and Portland, focused on DOE's conservation and solar programs which are administered by state and local governments. Finally, in the Denver workshop, participants looked at a set of issues related to DOE's conduct of solar/conservation research and development.

Solar and Conservation Policy

The first 1980 Section 11 meeting, held in Durham, North Carolina on June 29 and 30, was organized to discuss the Department of Energy's policy for solar and conservation, and the means by which that policy is translated into programs and activity. Major issues explored at the meeting included the lack of cross technology comparisons in DOE's resource allocation process, the role of government in supporting solar and conservation, and the relation of conservation and solar policy to national energy policy. It also examined several analytical tools which could aid in policy analysis. Twenty-five participants attended the meeting, representing the Department of Energy, universities, research organizations, public interest groups, utilities, the Environmental Protection Agency, Congressional committee staff, and industry.

Least-Cost Energy Strategy. The first session began with a brief talk by Dennis Bakke, of the Mellon Institute's Center for Energy Productivity, on the Least Cost Energy Strategy. In the group discussion that followed Bakke's talk, participants considered the least cost approach and its potential application to DOE's resource allocation process. The least-cost approach, as described by Bakke, examines energy needs in terms of the services provided to people at the end-use point: heating and cooling for buildings, illumination, automotive motion, etc. The least-cost approach involves analyzing the various alternative sources of energy that could provide a given end-use service to determine the least expensive source for that service, taking external costs such as environmental degradation into account. In the work done by the Mellon Institute, conservation is a key element of the least-cost approach, as it represents some of the cheapest approaches to meeting end-use needs that are available.

---

*More complete summaries of these meetings are included in the *Background Document for the National Hearing*, published by EPA in September 1980.

The participants generally approved of the least-cost strategy, though several expressed concern that it does not necessarily provide DOE with the criteria needed to choose between various energy programs. There was also criticism that the least-cost strategies developed by Mellon do not adequately incorporate all the important external costs of energy technologies.

Role of Government/Oil Import Premium. The second session was opened with a talk with Alvin Alm from the Kennedy School of Government at Harvard University, who spoke on the role of the Federal government in energy and need for a rational framework for selecting government programs based on cross technology comparisons. He emphasized that Government policy should serve to complement the energy market, not to direct it. Until a freely-operating energy market can be achieved, he acknowledged that the Government had additional roles in removing impediments to the free market, and mitigating some of its negative effects.

Considerable discussion was generated by Alm's suggestion of calculating a "premium" price on oil — a price somewhere above market price that would incorporate the external costs to our national security associated with importing oil — and using that as a cost yardstick against which to measure proposed energy programs. Cross technology comparisons using the oil premium measure, it was suggested, could permit conservation and solar policy to be directed without relying on specfic quantitative goals for conservation or solar. It was also expected that cross technology comparisons would demonstrate the economic attractiveness of conservation and solar, and result in increased emphasis on both in DOE's budget.

Application of Analytical Tools. The third session of the meeting was devoted to small work group discussions on the application of conservation and solar policy to each of four energy end-use sectors: residential, commercial, industrial, and transportation. In each work group, participants attempted to apply the least-cost approach to choosing programs in the given end-use sector. The problems of applying the cost-benefit methodologies to various government activities — research and development, regulation, commercialization, and so on — were examined as part of this task. Findings and conclusions of the work groups were reported to the whole meeting for discussion and comment during the fourth session.

Conservation and Solar Program Evaluation

EPA's panel on conservation and solar program evaluation met on July 8 and 9, 1980, at the Vallombrosa Center in Menlo Park, California. This meeting was designed to assess the adequacy of DOE's current evaluation activities and to develop constructive recommendations for improvement. Recognition of the need for more evaluation appears to be developing in DOE, and this meeting was designed to complement DOE's efforts to enhance its evaluation capabilities.

Participants were selected to represent several areas of expertise. Most of the 38 participants had experience in designing and implementing evaluations of conservation of solar programs for the Federal government in energy and need for a rational framework tion, several evaluation methodologists were invited who were familiar with the development and current state-of-the-art of evaluation in other fields, such as education and human services.

Defining Evaluation. In the first session of the meeting the group focused on clarifying and reaching consensus on a working definition that differentiates evaluation from other forms of data collection and analysis. The first conclusion reached by the group was that evaluation is a retrospective activity and should be distinguished from projections and forecasts.

Participants agreed that evaluation should not be narrowly defined to include only program impacts. Instead, it can apply to studies of results **and** processes. In fact, participants felt that for most purposes, quantitative measurement of impact alone is inadequate — that a useful study must also provide insight into **why** certain outcomes occurred.

The Role of Evaluation. Following this initial discussion, participants broke into small groups to consider the past, present, and potential future role of evaluation of DOE. There was general agreement that DOE does not currently use evaluation to support these processes and that the role of evaluation should be expanded. Participants stressed, however, that all evaluations must be done carefully — that DOE must be sensitive to the limits of evaluation, its cost, and the potential for its misuse.

Scope of Evaluation. In the second session, participants met in small groups to discuss (1) what types of programs should be evaluated, and (2) how programs and projects should be selected. Some participants felt that all programs should receive some type of evaluation and that DOE should obtain information on the results of all of its investments. Other participants argued that it was impractical to attempt evaluation of all programs, and that in some instances evaluation was a waste of time and money.

This session demonstrated clearly the problems involved in setting criteria for selecting which programs to evaluate. Groups suggested numerous separate elements that could be employed, but there was fairly wide agreement on a few factors that should be used in setting priorities. These included: existence of a requirement for evaluation, such as a Congressional mandate; feasibility and likelihood of obtaining information; size or importance of program; and relevance to decisions.

Selected Implementation Issues. In the third session, participants met in small groups to discuss specific methodological or operational issues that had been identified during previous sessions. Topics for these groups included:

- Determining causality and the use of control groups: The group felt that a key factor in establishing causality is the degree to which an evaluation is able to include measures of intermediate outcomes as well as measures of ultimate outcomes, such as energy savings.

- Useful and effective indicators: The group stressed that it was important to distinguish "consumption" from "efficiency," the latter requiring a link between energy inputs and products or service outputs. The group also noted that indicators have limited usefulness unless they reflect the value of energy conserved in terms of location, time, and quality of energy.

- Evaluation of R&D programs: The group believed that it is important to learn as much as possible from all programs, but they agreed that basic R&D presents particularly thorny problems for evaluators.

- Responsibility for evaluation within DOE. The group felt that roles should be defined as follows: program managers should conduct evaluations; the Office of Policy, Planning, and Evaluation with Conservation and Solar should have an evaluation unit with a clearly defined purpose; and the Assistant Secretary for Policy and Evaluation should have staff committed to evaluation, and should primarily be responsible for technical assistance in evaluation.

Selling Evaluation. In the final session, participants stressed the need to "sell" evaluation within DOE since it now lacks broad support. Obvious barriers exist to building support for evaluation at DOE: budget constraints, insufficient staff and staff turnover, perceptions of evaluation as a threat, and time spent "firefighting." To overcome these barriers, participants believed that several steps are crucial. First, departmentwide policy on evaluation must be established. Second, responsibility for evaluation must be clearly assigned, and people must be personally accountable for planning and conducting evaluative studies. Third, methodologies should be developed to promote the credibility of evaluative study results. Finally, an "evaluation ethic" must be fostered at all levels, which views evaluation as a learning process, not a punitive one.

State and Local Assistance Programs (I)

The first Section 11 Workshop on state and local programs was held in Minneapolis, Minnesota, on July 17 and 18, 1980, at the Bloomington Marriott Hotel. The workshop focused on state and local energy programs funded and managed by the Department of Energy's Office of Conservation and Solar Energy. Specifically, the workshop examined five predominately conservation-oriented programs: the Weatherization Assistance Program (WAP), the Institutional Buildings Grants Program (IBGP), the Residential Conservation Service (RCS), the State Energy Conservation Program (SECP), and the Energy Extension Service (EES). In addition, attention was given to the proposed Energy Management Partnership Act (EMPA), which would combine the EES and SECP.

Along with two observers from the Department of Energy, the group was composed of 29 representatives of city, county and state governments, public interest groups, electric utilities, community action agencies, and private consulting firms. The participants spent most of the time in four small work groups. Each group considered one specific program, with the exception of the group which examined together the SECP, EES, and the proposed EMPA legislation. While in the small groups, the participants focused on identifying strengths and weaknesses of the existing programs and developing suggestions for their improvement.

Residential Conservation Service (RCS). The Residential Conservation Service group viewed the RCS program as a worthwhile, well-intended effort that has a number of potentially serious flaws. Most of the discussion session was spent identifying these flaws and developing recommendations for their remedy.

One of the serious program flaws identified by the discussion group was the lack of specific program goals and evaluative mechanisms which would motivate the states and utilities to run effective programs. They felt that RCS program goals, rather than specifying only the percentage of homes to be offered the audit service, should specify perhaps a goal of actual energy savings (based on utility energy sales) to be achieved through the program.

A major criticism voiced during the group discussion concerned state program funding. The participants were unanimous in believing that giving the states responsibility for developing RCS plans without providing Federal assistance for developing and administering the plans was a major flaw in the program structure. The strong recommendation was that Congress authorize funds for state RCS planning and administration. Along the same line, the group recommended that each state be required to perform periodic evaluations of their RCS programs, in order to judge the success of audit services in motivating energy conservation.

Another group concern related to the possible exclusion of low-cost/no-cost measures from the audits. The group recommended that DOE repeal the prohibition on recommending unspecified measures, and perhaps require discussion of low-cost/no-cost measures as part of the audit.

Institutional Buildings Grants Program (IBGP). The consensus of the Institutional Buildings Grants Program group was that the IBGP, though plagued with problems during its first year of operation, has provided some real benefits and should be continued with various improvements.

One of the primary criticisms of the IBGP brought out in the discussion concerned program pacing. All the participants considered the program's first two grant cycles to have been rushed, with little or no advance notice of upcoming requirements and deadlines. The group recommended that future grant cycles cover a year, to give the states adequate time to prepare their plans, to notify and assist the local institutions, and to allow participating institutions time to coordinate the Federal assistance with their own capital improvement programs.

Another concern was the uncertain future of the program. Without the continuity of a new multi-year funding authorization, some participants felt that local participation will suffer. They felt that without reauthorization for at least another two or three years, program success and effectiveness would be limited, at best.

The participants representing local governments expressed their frustration that the technical assistance they needed for understanding and particpating in the program has been inadequate in the past, from both the Federal and state levels, and often too late when available to be useful. The group was also concerned about the complexity of applying for and reporting on small IBGP grants. It was recommended that DOE provide simpler, less detailed grant application forms and reduced reporting requirements for small grant applicants.

Weatherization Assistance Program (WAP). DOE program management was a main theme of the Weatherization Assistance Program discussion. There was consensus among the work group members that management at all levels of the program — Federal, state and local program operators — has been generally weak. Another recurring theme of the discussion was the importance of program flexibility in effective program planning and operation at the state and local levels. Participants pointed out repeatedly that the wide variations in local weatherization needs, conditions, and resources make it essential to allow states and local operators wide latitude in structuring their programs.

DOE was criticized for having concentrated too much decision making authority in its Headquarters office. All participants felt that the role of DOE's regional offices in the Weatherization Program should be expanded to allow for more frequent, closer contact between the states and DOE. To spur states whose weatherization programs have lagged, the group recommended that DOE make greater use of its authority to reallocate weatherization funds from states not using their full grants to states whose programs could use more money.

A prime concern of the work group was program funding. The participants agreed that WAP should proceed as rapidly as feasible toward the goal of reaching all eligible low-income households. Group consensus was that there are enough areas in the country now capable of greatly expanding their programs to warrant substantial budget increases for WAP.

State Energy Conservation Program (SECP)/Energy Extension Service (EES). One of the discussion's general themes involved the group perception that DOE lacks understanding of the ways in which state and local governments operate. Participants felt that without sufficient attention to state and local processes, DOE is bound to continue imposing programs on state and local governments at those levels that are difficult to implement and often do not promote energy conservation.

The group agreed that communication channels between state, local and Federal levels need to be improved, both horizontally and vertically. Localities and states need better mechanisms to exchange conservation program information among themselves, and DOE needs the capacity to learn from state and local experiences in developing its conservation programs. A specific recommendation was made that the President's Clearinghouse on Community Energy Efficiency be continued and expanded to meet the needs of a wider range of state and local governments and citizens' groups.

Participants expressed concern over the multiplication of new government units and programs with the implementation of new conservation initiatives, and recommended that EMPA contain provisions to encourage the use of existing governmental mechanisms in providing conservation support to the states and localities. The group argued that state energy offices be given a larger role in reviewing and coordinating local conservation programs, largely from a concern that DOE's regional offices are not equipped to adequately perform these functions.

Regarding program funding, there was consensus that Congress should set funding levels appropriate to meeting the program goals; that is, more ambitious programs such as SECP and RCS should receive considerably more funds than they are now allocated.

Research and Development and Application

The fourth Section 11 meeting was held in Denver, Colorado on July 24 and 25, at the Denver Marina Hotel. The workshop examined a variety of issues related to DOE's conduct of research, development, and application programs involving solar and conservation technologies.

Like the Minneapolis Workshop, the Denver session was organized so that participants spent most of their time in small work groups. Rather than focusing on specific DOE programs, however, the work groups at the Denver Workshop each considered a different aspect of DOE's research, development and application process. One work group examined conservation and solar program balance issues; another explored innovation and how DOE's programs promote or stifle it; and the third group examined DOE's information dissemination activities. The workshop was attended by 34 participants, along with one observer from the Department of Energy. The group was composed of representatives from state and local governments, private research institutes, state and regional solar energy centers, the Solar Energy Research Institute (SERI), universities, public interest groups, and Congressional committees.

Program Balance. The program balance group examined the balance of Federal funds currently supporting solar and conservation programs, both within and outside of DOE. They explored various objectives and criteria which guide Federal investments in conservation and solar, and developed recommendations to DOE for improving these criteria.

Early in the discussion, several participants stressed the need for DOE's funding of solar and conservation to reflect a commitment to attaining the goals established for these technologies in national energy policy. The work group strongly criticized DOE for not having taken these goals seriously in providing for the solar and conservation programs. Participants saw a persistent bias in both DOE and Congress against energy technologies with significant near-term potential, including passive solar and building conservation technologies, as opposed to longer-term supply technologies, many of which receive heavier funding. The group was unanimous in emphasizing the critical need for promoting near-term technologies, particularly conservation.

The group considered how DOE could increase the effectiveness of its current conservation and solar spending, and developed the recommendation that more funds be targeted at states, localities and private industries which have committed their own funds to conservation or solar efforts. The participants saw cost sharing projects and programs as having greater chances for success than those funded by DOE alone.

The group agreed that cost-effectiveness must become the primary criterion for DOE's program funding decisions. The participants urged that no DOE expenditures be made on energy supply technologies without an explicit comparison to the cost-effectiveness of conservation alternatives, stating that DOE's broad mission should be to support the development of the least expensive forms of energy, within the bounds of environmental and other necessary considerations.

Innovation. The innovation group's consensus was that for a number of reasons DOE rarely has been successful in supporting innovation in its solar and conservation programs. Several of the reasons involve the difficulties small firms and individual inventors often have participating in DOE programs. There was consensus that effective efforts on DOE's part to support innovation in solar and conservation must include the innovative small firms and inventors.

Other barriers to innovation identified by the group were: the excessive management burdens placed on DOE program managers; DOE's emphasis on long-term program planning, which leaves little opportunity for funding higher-risk innovative technologies; DOE's extensive use of the National Laboratories in research and development work; and DOE's procurement process, which discourages and, in some cases, prevents small firms from participating in solar and conservation work.

The group discussed DOE's Office of Small Scale Technology (OSST), which contains the Appropriate Technology Grants Program and the Energy-Related Inventions Program. There was agreement among the group members that the two programs are worthwhile, but underfunded and poorly integrated with DOE's other solar and conservation programs. They recommended that the total OSST funding be increased to at least 1% of the total DOE budget.

The group also explored possible alternatives to direct government involvement in technology development. One of these alternatives which received considerable discussion was Federal support of private organizations, such as the Center for Innovation in Butte, Montana, which promotes energy-related innovation by assisting small businesses and inventors in bringing their inventions to the market. Several members of the group expressed their opinion that government-funded private innovation centers could take over and expand the innovative function of DOE's OSST without the difficulties they saw in large DOE-directed programs.

Information Dissemination. The main theme of the information dissemination work group's discussion was the need for better coordination of the solar and conservation information activities of the numerous DOE programs and other Federal agencies. The group agreed that the various solar and conservation information programs need more sharply defined, distinct roles in order to reduce duplication of services and enable information users to better understand the array of information services available. They made specific recommendations of coordinated roles that the major organizations — NSHCIC, SEIDB and the RSEC's — should serve. There was consensus among the group members that all primary information organizations need to offer both solar and conservation information, since solar and conservation technologies are so closely related.

The group discussed the problems associated with maintaining quality control over energy information sent out by DOE. There was general consensus that the actual extent of inaccuracy and inconsistency is unknown, and that better mechanisms for assessing informational quality need to be set up within each information program. The work group spent much time discussing the critical need for evaluation in building effective energy information programs. Participants emphasized the importance of well-designed user surveys in information program evaluations.

Participants agreed that solar/conservation information programs need to adopt more aggressive advertising and marketing attitudes, rather than merely providing information to requestors. It was observed that appropriate solar and conservation technologies vary considerably from region to region, so that information marketing efforts need to be targeted for specific areas and localities.

State and Local Assistance Programs (II)

The last Section 11 workshop was held in Portland, Oregon, on July 29 and 30, at the Portland Hilton Hotel. The workshop, like the Minneapolis workshop, focused on DOE's state and local conservation programs. In addition to four observers from the Department of Energy, the group's 61 participants included representatives from state, county and local government, community action agencies, utilities, Congressional committees, public interest groups, private industry, and other institutions involved in state and local conservation programs. The Portland workshop was organized in the same way as the Minneapolis workshop, with most of the participants' time spent in small work groups, each of which examined a different DOE program. The work groups focused on identifying strengths and weaknesses of DOE's programs and developing suggestions for improving these programs.

Residential Conservation Service (RCS). The work group considered the RCS programs goals laudable, but found many problems with the program's structure and funding which weaken its chances for success. There was strong consensus among the participants that the current $5 million funding level is inadequate to the task of reaching 60 million homes. They criticized Congress for not taking the program seriously enough to provide for funding in the RCS authorizing legislation, and called for expanded funding to satisfy state and utility needs, as well as those of DOE.

A second theme of the group discussion was the excessive level of detail and direction in program legislation and regulations. Local flexibility was regarded by all as an essential ingredient in program success, and there was considerable concern that the program regulations as they now exist will severely hamper the states and utilities in fashioning effective RCS programs. The proper role, all agreed, is for Congress to set the overall policy goals and objectives of the program, and for the states and utilities implementing the program to develop the locally appropriate methods for achieving those program goals.

The work group spent considerable time exploring the problems of motivating homeowners to take part in RCS, and identified key improvements that are needed in the program to ensure its credibility among homeowners. There was consensus among the group that the program should focus more on providing incentives for participation, and contain less emphasis and regulatory detail on the "hand-holding" aspects of the arranging/financing/installing services to be provided by utilities. A majority of the group participants felt that state listing of financing institutions and contractors/suppliers will not work as intended by Congress, and recommended that its requirement be dropped from the legislation.

Institutional Buildings Grants Program (IBGP). The Institutional Buildings Grants Program group generally agreed that the IBGP has achieved a fair measure of success, though the program was plagued by serious problems in its first two years.

Program continuity was an important theme of the discussion. Given the problems experienced during the program's first two years and the time spent resolving some of those problems, the participants felt strongly that the IBGP needs to continue for at least a few more years. The group recommended that Congress reauthorize and fund the IBGP for at least another three years.

Another concern raised in the discussion was the issue of state flexibility in apportioning funds. The group considered the present regulations too restrictive in several ways, causing funds to go unspent. There was consensus among the group that the excessive degree of detail in the IBGP authorizing legislation was the source of much of the regulatory restrictiveness.

The participants expressed a general concern over the lack of effective communication between DOE and the state energy offices involved in the IBGP. This lack of communication, all agreed, had caused considerable delays in the identification and resolution of problems within the program. They felt that it is essential to establish some formal structure for periodic, ongoing talks between DOE headquarters, its regional offices and the state offices.

Weatherization Assistance Program (WAP). The WAP work group explored a variety of topics related to improving the program and coordinating it with other conservation programs, particularly the RCS, which also provide services to low-income homeowners. The group participants generally considered WAP to have improved significantly in the last year, but they identified some program areas of concern that need attention by DOE and Congress.

The work group participants were unanimous in recommending expanded funding for WAP, citing the relatively slow progress toward weatherizing the nation's low-income dwellings being made with the current $200 million per year program. They pointed out the large imbalance between the Home Energy Assistance Program and WAP budgets, and asked that DOE provide for better coordination and balance between the programs.

Another issue covered by the group was that of coordinating WAP with the RCS and locally initiated weatherization programs. There was strong consensus that the services of these programs need to be carefully coordinated to maximize their benefit and avoid redundant, wasted efforts. Rather than attempt to dictate local cooperative arrangements for these programs through Federal regulation, which several participants felt could not work, the group recommended that DOE do two things: (1) ensure that its program regulations for RCS and WAP do not constrain local coordinative efforts, and (2) encourage local initiative in this area through non-regulatory means such as providing technical assistance and information exchange among communities.

State Energy Conservation Program (SECP)/Energy Extension Service (EES). Two groups were organized to discuss SECP and EES, and they brought different perspectives to their discussions, due to their composition: Group A contained a majority of state level energy officials, while Group B contained more local level officials.

Group A: The participants were of the general opinion that the SECP and EES programs have been, on the whole, beneficial in promoting state and local conservation efforts. The program weaknesses they identified involved such issues as the potential overlap of various programs, the lack of adequate program evaluation, and the confusing flow of energy information from DOE.

There was consensus among the participants that Federal funding for state and local programs needs to be more appropriate to the program goals: that is, Federally established programs with ambitious goals such as SECP need a commensurate level of Federal assistance to enable them to achieve the goals. The issue of how states should allocate local funds among commmunities was discussed in the work group, with most of the participants agreeing that a consistent formula balancing entitlement and competitive funds needs to be developed.

The group discussed the need for better communication among local energy offices, to enable the exchange of ideas and program successes. They saw an important role for DOE in this process as a facilitator of local information exchange, providing travel money and organizing meetings for local energy officials.

Group B: The main theme that emerged from the second SECP/EES work group's discussion was the importance of energy conservation efforts organized at the community level. The participants were convinced that conservation programs, whether originating at the Federal, state, or local level, must involve and tie into local institutions and governments in order to be effective. They felt that both Congress and DOE give too little attention and support to the role of localities in energy conservation, and expressed the hope that this lack is beginning to be corrected through development of the EMPA legislation.

Given the limited Federal conservation funds that currently are designated for local use, the group recommended that DOE target the funds toward building community level institutions which will promote conservation. Regarding the EES, the group recommended that the program should adopt a more aggressive approach to marketing energy information. They considered the present program's "passive" approach to have had little effect on energy conservation.

Another major recommendation that emerged from the group discussion was that DOE establish a network of training centers for local energy managers, structured to provide education in the various skills needed to deal effectively with state and local Federal government and run conservation programs at the local level.

participants

EPA Section 11 Meeting on Conservation and Solar Energy Policy Analysis
Duke University, Durham, North Carolina
June 29 and 30, 1980

Alvin L. Alm
Harvard University,
Cambridge, Massachusetts

Dennis Bakke
Mellon Institute,
Arlington, Virginia

James Bishop
Burson-Marsteller,
Washington, D.C.

Colin Blaydon
Duke University,
Durham, North Carolina

Clark Bullard
University of Illinois,
Urbana, Illinois

Melvin H. Chiogioji
DOE, Conservation and Solar Energy,
Washington, D.C.

Norman Dean
National Wildlife Federation,
Washington, D.C.

Gerald Decker
Kaiser Aluminum and Chemical Corporation,
Oakland, California

James Drewry
Gas Research Institute,
Chicago, Illinois

Carl Gawell
Solar Energy Research Institute,
Golden, Colorado

Michael Gillette
DOE, Office of Policy and Evaluation,
Washington, D.C.

Thomas Glennon
Rand Corporation,
Washington, D.C.

Paul Greiner
Edison Electric Institute,
Washington, D.C.

James Harding
Friends of the Earth,
San Francisco, California

Robert Hemphill
Tennessee Valley Authority,
Chattanooga, Tennessee

Robert Koger
North Carolina Public Utility Commission,
Raleigh, North Carolina

Wesley Magat
Duke University,
Durham, North Carolina

John Milhone
DOE, Conservation and Solar Energy,
Washington, D.C.

William Morrill
Mathematica,
Princeton, New Jersey

J. Michael Power
DOE, Conservation and Solar Energy,
Washington, D.C.

James Quinn
DOE, Conservation and Solar Energy,
Washington, D.C.

James Spensley
House Subcommittee on Energy Development and Applications,
Washington, D.C.

James Stukel
University of Illinois
Urbana, Illinois

David Tunderman
EPA, Office of Planning and Evaluation,
Washington, D.C.

participants

EPA Section 11 Meeting on Conservation and Solar Energy Program Evaluation
Menlo Park, California
July 8 and 9, 1980

Peter Back
DOE, Conservation and Solar Energy
Washington, D.C.

Eva L. Baker
Center for the Study of Evaluation
Los Angeles, California

Barbara Barkovich
California Public Utilities Commission,
San Francisco, California

Lynda Carlson
Energy Information Administration,
Washington, D.C.

Brad Chase
State Office of Policy and Management,
Hartford, Connecticut

Lynn Collins
Alliance to Save Energy,
Washington, D.C.

Elizabeth Cooper
Regional Solar Energy Center,
Portland, Oregon

John Cooper
Pacific Gas and Electric,
San Francisco, California

Peter deLeon
Science Applications, Incorporated,
Englewood, Colorado

Warren Fujimoto
Pacific Gas and Electric,
San Francisco, California

Seymore Goldstone
California Energy Commission,
Sacramento, California

Bruce Hannon
University of Illinois,
Urbana, Illinois

James Harding
Friends of the Earth,
San Francisco, California

Jeffrey Harris
Lawrence Berkeley Laboratory,
Berkeley, California

David Harrje
Princeton University,
Princeton, New Jersey

Eric Hirst
Oak Ridge National Laboratory,
Oak Ridge, Tennessee

Bruce Hutton
University of Denver,
Denver, Colorado

Keith Kozloff
Minnesota Energy Agency,
St. Paul, Minnesota

Ron Larson
Solar Energy Research Institute,
Golden, Colorado

Mark Levine
Lawrence Berkeley Laboratory,
Berkeley, California

John Moore
Academy for Contemporary Problems,
Columbus, Ohio

Joe Nay
Performance Development Institute,
Washington, D.C.

David Nichols
Senate Governmental Affairs Committee,
Washington, D.C.

Lewis Perleman
Jet Propulsion Laboratory,
Pasadena, California

Robert Plunkett
DOE, Conservation and Solar Energy,
Washington, D.C.

Michael Power
DOE, Conservation and Solar Energy,
Washington, D.C.

Sam Stewart
Sam Stewart and Associates,
St. Paul, Minnesota

Robert St. Pierre
Abt Associates,
Cambridge, Massachusetts

Tom Swanson
Tennessee Valley Authority,
Chattanooga, Tennessee

Grant Thompson
Conservation Foundation,
Washington, D.C.

Catherine Waddell
California Public Utilities Commission,
San Francisco, California

Keith J. Ward
Auburn University,
Auburn, Alabama

Robert E. Webber
Michigan Energy Administration,
Lansing, Michigan

Carl York
Lawrence Berkeley Laboratory,
Berkeley, California

participants

EPA Section 11 Meeting on State and
Local Energy Conservation Programs
Minneapolis — St. Paul, Minnesota
July 17 and 18, 1980

Robert Anderson
Consultant,
Chanhassen, Minnesota

Kathleen Birmingham
Comprehensive Community Energy
Management Program,
Detroit, Michigan

W. Kim Boas
Department of Central Services,
Dayton, Ohio

Barbara Brown
Governor of Florida's
Energy Office
Tallahassee, Florida

Ann Cline
Comprehensive Community Energy
Management Program,
Richmond, Indiana

Kenneth Paul Dobbs
Barton, Ashman & Associates,
Evanston, Illinois

Marion S. Feeney
USDA, Community Energy Conservation,
Washington, D.C.

Phillip Gillespie
Schenectady Community Action Program,
Schenectady, New York

Gary Grufman
League of Minnesota Cities,
St. Paul, Minnesota

Jeff Hammarlund
DOE, Conservation and Solar Energy,
Washington, D.C.

James R. Hays
Energy Coordinator,
Toledo, Ohio

Lex Hester
Florida State Energy Office,
Tallahassee, Florida

Judy Karon
Ramsey County Energy Coordinator,
St. Paul, Minnesota

June Kenfield
New York State Energy Office,
Albany, New York

Fred Klein
City of Milwaukee,
Milwaukee, Wisconsin

Al Lessik
Minnesota Energy Agency,
St. Paul, Minnesota

Paul F. Levy
Arkansas Department of Energy,
Little Rock, Arkansas

John G. McMillan
Hennepin County Energy Coordinator
Minneapolis, Minnesota

Robert Pauls
Energy Coordinator,
Carbondale, Illinois

Margaret Post
Minnesota Energy Agency,
St. Paul, Minnesota

Bill Rolland
AHP Energy Associates,
Minneapolis, Minnesota

Pat Rose
DOE, Conservation and Solar Energy,
Washington, D.C.

William Schott
Base and Electric Power Cooperative,
Bismark, North Dakota

J. Randy Shick
Illinois Solar Resource Advisory Council,
Springfield, Illinois

Paul Richard Thomas
Ohio Cooperative Extension Service,
Columbus, Ohio

Timothy P. Wilson
Maine Division of Community Services,
Augusta, Maine

Alec Wisch
Energy Division,
Pittsburgh, Pennsylvania

Ron Wise
State of Missouri
Jefferson City, Missouri

participants

EPA Section 11 Meeting on DOE Research, Development and Application
Denver, Colorado
July 24 and 25, 1980

Lynn Collins
Alliance To Save Energy,
Washington, D.C.

Sam Doctors
University of Pittsburgh,
Pittsburgh, Pennsylvania

Gene Frankel
House Committee on Science and Technology,
Washington, D.C.

Scott Grace
EPA,
Denver, Colorado

Joan Habib
Franklin Research Corporation,
Washington, D.C.

Blair Hamilton
Memphremagog Group,
Newport, Vermont

Jeff Hammarlund
DOE, Conservation and Solar Energy,
Washington, D.C.

Janice Hamrin
California Energy Commission,
Sacramento, California

Margie Harris
Western SUN,
Portland, Oregon

Harold Liebowitz
Center for Renewable Resources,
Washington, D.C.

John Lowry
National Center for Appropriate Technology,
Butte, Montana

David Miller
New Mexico Solar Energy Institute,
Las Cruces, New Mexico

Steve Nelson
Northeast Solar Energy Center,
Boston, Massachusetts

Web Otis
Golden Gate Energy Center,
San Francisco, California

Jerry Plunkett
Montana Energy and MHD Research and Development Institute,
Butte, Montana

David Roessner
Solar Energy Research Institute,
Golden, Colorado

Carl Strojan
Solar Energy Research Institute,
Golden, Colorado

Rafael Ubico
Solar Energy Research Institute,
Golden, Colorado

Lynn Wray
Energy Conservation Operation and Maintenance,
Grand Lake, Colorado

Jeff Witwer
SRI International
Menlo Park, California

Marvin Yarosh
Florida Solar Energy Center,
Cape Canaveral, Florida

Michael Yokell
Resource Management Consultants, Incorporated,
Boulder, Colorado

participants

EPA Section 11 Meeting on State and Local Energy Conservation Programs
Portland, Oregon
July 29 and 30, 1980

Mary Anderson
Oregon Department of Energy,
Salem, Oregon

W.S. Baker
Oregon State University,
Hillsboro, Oregon

Mike Barrett
House Subcommittee on Energy
and Power,
Washington, D.C.

Bernie Birnbaum
Citizens for Solar Washington,
Seattle, Washington

Michael Bull
King County Energy Coordinator,
Seattle, Washington

John Burge
City of Kansas City, Missouri

Robin C. Calhoun
HDR, Incorporated, Energy and
Environmental Programs,
Seattle, Washington

Lee Callaway
Pacific Gas and Electric,
San Francisco, California

Mel Chiogioji
DOE, Conservation and Solar
Energy,
Washington, D.C.

Clay Dunlop
Washington State Energy Office,
Olympia, Washington

Nicholas Fedoruk
DOE, Conservation and Solar
Energy,
Washington, D.C.

Leonard Gassner
Oil Heat Institute of Oregon,
Portland, Oregon

Mark Ginsberg
Arizona Energy Office,
Planning and Economic
Development,
Phoenix, Arizona

Mona Green
Public Utility Commission,
Salem, Oregon

Donald Grimm
Pacific Power and Light,
Portland, Oregon

Glenn O. Harding
Oil Heat Institute of Oregon,
Portland, Oregon

Karen Hastings
Colorado Energy Office,
Grand Junction, Colorado

Karen Heidel
City Manager's Office,
Tucson, Arizona

Dan Hitchcock
Pacific Power and Light,
Portland, Oregon

Duane Keeran
Texas Energy and Natural
Resources Advisory Council,
Austin, Texas

Veronica Kun
Senate Committee on Energy and
Natural Resources,
Washington, D.C.

Larry Landry
Arizona Office of Planning and
Economic Development,
Phoenix, Arizona

Ronald Lehr
Colorado Energy Conservation
Office,
Denver, Colorado

Andrew Lewis
Benton-Franklin Community Action
Committee,
Pasco, Washington

Jim Liles
Boulder Country Architect,
Boulder, Colorado

Melissa McClaren-Lighty
Environmental Management/
General Services Agency,
San Jose, California

Nancy H. McKay
League of Oregon Cities,
Salem, Oregon

Sandra Monje
DOE, Conservation and Solar
Energy,
Washington, D.C.

Gregory Page
City Manager's Office,
Eugene, Oregon

Leon Peterson
Utah Energy Office,
Salt Lake City, Utah

Theodor Rauh
California Energy Commission,
Sacramento, California

Paul Raver
Resources Program Coordinator,
Santa Ana, California

Jean Reeder
Energy Conservation Center of the
Eugene, Oregon Electric Board,
Eugene, Oregon

Donald Rocks
Department of Administrative
Services,
Multnomah County, Oregon

Pat Rose
DOE, Conservation and Solar
Energy,
Washington, D.C.

Sam Sadler
Oregon Appropriate Technology,
Eugene, Oregon

Sam Sperry
City Energy Office,
Seattle, Washington

Dennis J. Sykes
California Energy Extension
Service,
Sacramento, California

Darshan S. Teji
Department of Facilities and
Maintenance,
Phoenix, Arizona

Paul Tutino
General Office of Services,
Oakland, California

Phillip Welker
Idaho Office of Energy,
Boise, Idaho

Ray Wiley
Oregon Energy Conservation
Board,
Eugene, Oregon

Lynn Youngbar
Portland SUN,
Portland, Oregon

B. Conservation and Solar Program Evaluations

Exhibit 1 presents an overview of a sample of past conservation and solar program evaluations. It includes a brief description of the program, the purpose of the evaluation, and the evaluation methodology (including the major criteria used to measure program success). It also indicates the organization that sponsored the study. Finally, in cases where information was available, the chart describes how the results of the evaluation were used and problems encountered in the design or implementation of the study.

Exhibit 2 presents information on selected current DOE evaluations of conservation and solar programs as of June 1980. Many of the studies are still in early planning and design stages, however, and little information is available on them.

Exhibit 1—Examples of Conservation and Solar Program Evaluation

Title	Energy Extension Service Pilot Program	Low-Cost, No-Cost Project Evaluation	State Energy Conservation Program	State Energy Conservation Program and Weatherization Assistance Program (1977 and 1978)
Program Description	• state grant program • legislatively mandated • to provide outreach information and technical assistance to small energy users	• multimedia marketing effort • to motivate residential consumers in 6 New England states to make energy conserving actions • combined mass mailing with TV advertising	• state grant program • legislatively mandated • combined mandatory and voluntary conservation measures	• SECP—see adjoining column • weatherization—assists low-income people to weatherize their homes • state-level administration
Purpose of Evaluation	• to assess impacts and costs of the program • to determine which service delivery mechanisms and target audiences were most cost-effective • to meet legislative requirements for evaluation	• to determine the effectiveness of the program to motivate New England households to adopt low-cost or no-cost conservation actions	• to evaluate operating effectiveness of activities and ability to achieve legislative objectives • to recommend program improvements	• to meet legislative requirement for annual report on activities of programs • to provide guidance for developing and improving administration and effectiveness
Sponsor	DOE/CSE/Office of Government Conservation Programs	DOE	DOE/CSE/Office of Government Conservation Programs	GAO
Methodology	• compared similar participant and non-participant groups • telephone survey of actions taken and planned, attitudes, and perceived usefulness of program services • collected activity data on costs, number of clients served	• a telephone survey compared a sample of 1200 New England households with a control group of 600 in New York • day-after recall tests of 100 households regarding television advertising • use of television diaries and follow-up questionnaires	• 9 sample states included • field visits and interviews with Regional Office, state staff • interviews with DOE Headquarters staff	• case study approach • field visits to 4 DOE Regional Offices and 24 states • review of state plans and policies • interviews with state and federal program staff
Major Criteria	• energy savings	• energy savings • dollar savings	• program effectiveness and goal achievement	• management effectiveness • compliance with requirements • projected energy savings
Use	• provided justification for expanding pilot to national program	• final report not released • could provide guidance to future energy conservation marketing efforts	• guidance to development of other grant programs • changes in instructions & guidance to states • additional technical assistance to states	• guidance on technical assistance needed by states
Problems Encountered	• identification of adequate control group • reliance on self-reported actions taken • no independent measurement of energy savings—estimates based on reported actions	• identification of adequate control group • reliance on self-reported actions taken • no independent measurement of energy savings—estimates based on reported actions	• timing—too early to assess actual impact	• timing—too early to assess actual impact and start-up problem not resolved

Exhibit 1 — Examples of Conservation and Solar Program Evaluation (continued)

Title	**Project Conserve**	**President's Domestic Policy Review of Solar Energy**	**Residential Solar Demonstration Program**	**Federal Solar Heating and Cooling Demonstration Program** • **Residential Buildings** • **Commercial Buildings**
Program Description	• 2 pilot sites (Topeka, Kansas and Danbury, CT) • computerized energy audit announced through utility mailing	• nationwide assessment of solar programs • public participation through regional hearings	• legislatively mandated • to demonstrate practical use of solar heating in 3 years, solar heating and cooling in 5 years • to develop performance criteria	• legislatively mandated • to demonstrate practical use of solar heating in 3 years, solar heating and cooling in 5 years • to develop performance criteria
Purpose of Evaluation	• to determine consumer response and energy savings	• to respond to Presidential directive • to assess all Federal solar programs as to whether they constitute optimal policy	• to describe experiences of those involved in market acceptance of solar houses • to explore trends in characteristics, opinions, and actions of participants	• to measure success in meeting program goals
Sponsor	FEA	Interagency Committee chaired by DOE	HUD/Office of Policy Development and Research	GAO
Methodology	• mail questionnaire to participants on actions taken and satisfaction • gathered use data from fuel bills	• panel reports • public testimony • document reviews	• marketing study • developed descriptive profiles of actors and institutions involved • personal interviews with 887 participants and 640 in comparison groups	• examined 20 operating demonstrations in 7 states • examined economic viability and technical soundness • reviewed management procedures • used interview, reviewed documents
Major Criteria	• energy savings	• program effectiveness	• market acceptance	• goal achievement
Use	• have followed up by monitoring response rates (requests for audits) • high response rates have been used to justify continuation of program	• one of several bases for recommendations for Presidential initiatives		
Problems Encountered	• changes in fuel use could not be directly tied to actions taken in response to programs	• evaluation started late in process • difficult to develop consensus on program assessments	• small sample size • sample not randomly selected so analysis and applicability of findings is limited	

Exhibit 1 — Examples of Conservation and Solar Program Evaluation (continued)

Title	**Tennessee Valley Authority's Home Insulation Program**	**Boiler Operator Workshop Evaluation**	**Evaluation of Telephone Energy Conservation Hotlines**	**Weatherization Program**
Program Description	• provides free audits and no-interest loans for weatherizing residences	• 2-day training program on energy conserving boiler adjustments	• 2 telephone hotlines run by the state energy office and the state's largest utility	• assists low-income people to weatherize their homes
Purpose of Evaluation	• to assess program impact during program's first 18 months	• to assess cost effectiveness of workshops for boiler operators in state-owned buildings	• to assess attitudinal and behavioral effects of services on callers	• to assess energy savings
Sponsor	TVA	State of Minnesota	State of Minnesota	State of Minnesota
Methodology	• pretest — post test design, participants served as their own controls • home energy surveys of housing characteristics and conservation actions • data on actual energy consumption taken from monthly bills	• surveys of workshop participants, one immediately following and one 24 months later • projection of fuel savings based on estimates associated with boiler adjustments	• randomly selected participants (178) and control group (169) • mail survey • examined census-type characteristics, weatherization actions performed, participant attitudes, energy savings • collected fuel use data on both groups	• examined 20 operating demonstrations in 7 states • examined economic viability and technical soundness • reviewed management procedures • used interview, reviewed documents
Major Criteria	• energy savings	• energy savings • dollar savings	• energy savings	• goal achievement
Use	• TVA reformulated forecasts of impact, reemphasized efforts to reach all residential consumers • TVA expanded data collection on program participants	• justified program		
Problems Encountered	• lack of data on individual participant characteristics • lack of control group to estimate actions that would have been taken in absence of program	• reliance on self-reported actions taken • no independent measure of energy savings — estimates based on reported actions	• response rates and incomplete questionnaires • obtaining reliable fuel use data, particularly for liquid fuel	

Exhibit 1 — Examples of Conservation and Solar Program Evaluation (continued)

Title	**Analysis of Cost Effectiveness of Appropriate Technology Programs**	**Federal Energy Management Program (several reports)**	**Federal Energy Management Program**	**Twin Rivers Project**
Program Description	• advises and assists Governor and state agencies • provides services to local government and community organizations	• legislatively mandated • to implement mandatory and voluntary conservation measures	• legislatively mandated • to implement mandatory and voluntary conservation measures	• examined requirements for effective retrofit strategy, role of the resident • sought to clarify role of field experiments
Purpose of Evaluation	• to fulfill state legislative mandate • to assess costs and benefits of office and its programs	• to assess progress of measures to conserve energy in Federal buildings and transportation systems	• to assess progress of measures to conserve energy in Federal buildings and transportation systems	
Sponsor	State of California	GAO	House Committee on Government Operations	NSF ERDA/DOE
Methodology	• separate direct and indirect benefits • data on programs derived from projections and estimates based on other studies, life-cycle cost analyses	• review whether available products are being used • review of plans and policies	• expert testimony • review of documents	• a group of nearly identical townhouses was weatherized and studied
Major Criteria	• estimated dollar savings	• cost benefit • compliance	• compliance • progam effectiveness	• energy savings
Use	• fulfill reporting requirement			
Problems Encountered	• no independent, direct measure of energy savings			

Exhibit 1 — Examples of Conservation and Solar Program Evaluation (continued)

Title	Residential Energy Utilization Analysis (Concord Pilot Study)	Energy Conservation Center Evaluation	Electrical Rate Demonstration Project
Program Description	- energy consumption analyses by trained inspectors were compared with do-it-yourself analysis by residents	- provided information in response to consumer questions about insulation, solar equipment, financing, etc.	- examined the potential of various feedback mechanisms to reduce energy consumption
Purpose of Evaluation	- to determine if either type of audit affected energy use - to determine which type was more effective	- to assess users' reactions to Center - to determine what actions were taken	- to assess effectiveness of different forms and frequencies of feedback
Sponsor	Pacific Gas and Electric	Pacific Gas and Electric	University of Washington
Methodology	- 2 participant and one control group - market research study of demographic, attitudinal, and behavioral differences between participants - statistical analysis of participant energy consumption using actual data where available	- telephone interviews with 100 randomly selected residential customers who had called the Center	- samples of consumers and control groups participated in experiments with differing rate structures, rebates, and varying feedback mechanisms - collected fuel use data
Major Criteria	- energy savings - cost	- client satisfaction	- energy savings
Use			
Problems Encountered			

Exhibit 2 — Current DOE Conservation and Solar Evaluation

Title	**Institutional Buildings Grants Program**	**Weatherization Assistance Program**	**Appropriate Technology Small Grants Program**
Program Description	• provides matching grants for energy audits, technical assistance, and conservation measures for schools, hospitals, local government buildings, public care institutions	• assists low-income households to weatherize homes to save energy • provides employment	• supports concept development, project development, project demonstration of "appropriate technologies"
Purpose of Evaluation	• to collect information on program operations prior to design of full-scale evaluation	• to assess effectiveness in meeting goals • to assess impact on energy use	• to develop findings and recommendations for administrative improvements in program • to assess program success in achieving goals
Sponsor	DOE/CSE	DOE/P&E	DOE/CSE/OISST
Methodology	• objectives for the program have been clearly defined and performance measures have been developed • interviews with people in target institutions and state offices • review of documents produced (e.g., audit reports)	• currently in design stage — plan full-scale evaluation in October 1980 • design activities — cleaning up data, pilot study in Minnesota to refine collection techniques for before and after data, designing questionnaire	• "evaluability assessment" • focus on management issues • interviews with Headquarters personnel, Program managers, Regional office staff, state staff, reviewers of applications, applicants, public interest organizations
Major Criteria			• management effectiveness
Use	• will be basis for full-scale impact evaluation (intended use)	• will be basis for full-scale impact evaluation (intended use)	
Problems Encountered		• delays	• measurement of program impact

Exhibit 2 — Current DOE Conservation and Solar Evaluation (continued)

B411
9

Title	Comprehensive Community Energy Management Program	Residential Conservation Service	Solar Heating and Cooling Demonstration Program	State Energy Conservation Program
Program Description	• 2 year pilot in 17 communities • provides local communities with materials and methodology for energy planning	• legislatively mandated • encourages energy conservation in homes through audits, lists of suppliers, loans • operates through utilities	• 4 year multi-state program involving residential, commercial, industrial users	• state grant program • legislatively mandated • combines mandatory and voluntary conservation measures
Purpose of Evaluation	• to examine the effectiveness of the program's analytical approach and process • to recommend modifications/ improvements to program		• to learn lessons which may be useful for subsequent solar demonstrations • to provide input into future solar policy initiatives	• to assess impact of program
Sponsor	DOE/CSE	DOE/P&E and CSE/BCS	DOE	DOE/CSE/Office of State and Local Programs
Methodology	• for each phase of planning, process documents produced are reviewed and participants are interviewed	• currently beginning work on an evaluation plan and design due in October 1980	• just beginning • direct interviews with a geographically dispersed sample of participants	• states take lead on collecting data • DOE provides technical assistance and validates a sample of state data
Major Criteria	• policy relevance of analytical approach • effectiveness of process			• energy savings
Use	• interim reports can assist other communities doing energy planning			
Problems Encountered	• planning phases are designed as sequential — in operation planning is not linear • timing — difficult to measure effects immediately			

References

Reports

Department of Energy. Domestic Policy Review Panel, *The Domestic Policy Review of Solar Energy.* A Response Memorandum to the President of the United States. TID-22834, February 1979.

Department of Energy. *Draft Policy, Programming and Fiscal Guidance, FY 1982-1986,* January 30, 1980.

Department of Energy. *Energy Conservation Program Summary Document, FY 1981,* February 1980.

Environmental Protection Agency. *1979 Section 11 Report to the President and Congress,* EPA 600/9-80-008. January 1980.

Environmental Protection Agency. *1980 Section 11 National Hearing Transcript,* EPA 600/9-80-060. December 1980.

General Accounting Office. *Energy Conservation: An Expanding Program Needing More Direction.* EMD-80-82. July 24, 1980.

General Accounting Office. *The Multiprogram Laboratories: A National Resource for Nonnuclear Research, Development and Demonstration.* EMD-78-62. May 1978.

National Academy of Sciences, National Research Council. *Energy in Transition:* 1985-2010, Final Report of the Committee on Nuclear and Alternative Energy Systems, San Francisco: W. H. Freeman and Co., 1979.

Office of Technology Assessment. *Conservation and Solar Energy Programs of the Department of Energy: A Critique,* GPO Stock No. 052-003-00757-6. June 1980.

Other Materials

Chelimsky, Eleanor, *An Analysis of the Proceedings of a Symposium on the Use of Evaluation by Federal Agencies, Vol. II,* MITRE Report M77-39, July 1977.

Cone, Bruce, *An Analysis of Federal Incentives Used to Stimulate Energy Production,* Battelle Pacific Northwest Laboratory, Richlands, Washington, PNL 24-10, Revision 2. February 1980.

Landsberg, Hans H., et al., *Energy, the Next Twenty Years* (Sponsored by the Ford Foundation and Administered by Resources for the Future), Cambridge, Mass.: Ballinger Publishing Company, 1979.

Salasin, John, et al., *The Evaluation of Federal Research Programs,* MITRE Technical Report MTR-80W 129, June 1980.

Sant, Roger, et al., *The Least Cost Energy Strategy,* The Energy Productivity Center, Mellon Institute, Pittsburgh: Carnegie-Mellon University Press, 1979.

Schurr, Sam H., et al., *Energy in America's Future: The Choices Before Us,* Johns Hopkins University Press for Resources for the Future, 1979.

Stobaugh, Robert, and Daniel Yergin, Eds., *Energy Future,* New York: Random House, 1979.

Wholey, Joseph S., et al., *Federal Evaluation Policy,* Washington, DC: The Urban Institute, 1976.